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RESEARCH UNIT FOR URBAN STUDIES
McMASTER UNIVERSITY
HAMILTON, ONTARIO

1983 HAMILTON-WENTWORTH COLLISION REPORT

PREPARED BY:
THE CITY OF HAMILTON TRAFFIC DEPARTMENT

1983 HAMILTON-WENTWORTH COLLISION REPORT

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1983 HAMILTON-WENTWORTH MOTOR VEHICLE COLLISION REPORT

Introduction

This annual report is a summary of factors associated with traffic collisions that occurred in the Regional Municipality of Hamilton-Wentworth in 1983.

Traffic collisions are a primary cause of accidental deaths (Appendix Exhibits A-1, A-2, and A-3), injuries and associated property losses. The intention of this report is to provide factual information to those agencies and persons concerned with the safety of the roadway transportation system within the Regional Municipality of Hamilton-Wentworth.

Traffic collisions frequently involve complex interactions between human behavior, vehicle characteristics, and the environment. The factor or factors responsible for causing a collision are not always the most obvious nor are they always readily apparent. Caution should be exercised in drawing conclusions from the statistics presented in this report and conclusions should be drawn only with appropriate qualifications and supportive information.

Additions and Changes Incorporated Into the 1983 Collision Report

The following are some of the additions and changes to the collision report for 1983:

- A new exhibit has been added to demonstrate temporal changes in alcohol involvement in motor vehicle collisions. This addition is as a result of requests from several interested bodies, such as the Hamilton-Wentworth Regional Police Department and the Hamilton Council on Road Trauma. The added exhibit is numbered 1-6.

- Exhibit 3-2, which portrays the effect of driver age upon driver actions, has been modified. Fifteen year old through 24 year old drivers, which were formerly organized into two age groups are now shown separated into individual age groups. The change provides more accurate insight into the actions of new drivers.

- Exhibit 6-5 of the 1982 and previous reports displayed road character at all collision sites. In the 1983 report, this information has been subdivided into two separate exhibits, one for intersection locations and one for non intersection locations.

- In a similar fashion, the exhibit in previous reports showing road alignment conditions at collision locations has been subdivided into two exhibits, one for collisions occurring at intersections and one for non intersection locations.

- Exhibits 7-5 and 7-6 describing collision rates on roadway sections within the City of Hamilton are new to the 1983 report. Exhibit 7-5 describes roadway sections exclusive of the effects of signalized intersections. Exhibit 7-6 describes roadway sections exclusive of the effects of all intersections.

- Exhibit 7-7 provides a summary of collision rates on arterial roadway sections for selected categories and subgroups.

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1983 HAMILTON-WENTWORTH COLLISION REPORT

Summary:

* In 1983, 7,268 reportable traffic collisions occurred on municipal roadways in the Region of Hamilton-Wentworth. These collisions resulted in:-

- 15 driver or passenger fatalities (10 motor vehicle drivers, 1 motorcyclist, 2 bicyclists and 2 riders or passengers)
- 5 pedestrian fatalities
- 3,649 driver, bicyclist or passenger injuries
- 387 pedestrian injuries
- 20,431 persons (equal to approximately 5 percent of the Regional population) being involved in a reportable traffic collision in 1983
- approximately 14 million dollars in property damages (as estimated at the time of the collision)
- 50 million dollars (estimated) in damages when all collision costs including medical costs, loss of income and other related costs are taken into account

* The overall frequency of collisions in Hamilton-Wentworth is generally lower than other major Canadian municipalities.

* The overall frequency rates of fatalities in the City of Hamilton are generally lower than other Canadian and U.S. cities of similar population.

* The period from 12 midnight to 5 a.m. exhibits the highest ratio of collisions to vehicle volume using the street system.

* The greatest causes of traffic collisions were driver or pedestrian error; either errors in judgement or perception, or non-observance of traffic regulations.

* The predominant improper driver actions indicated in collisions were "following too close" and "failure to yield right-of-way".

* Drivers under 20 years of age were involved in a disproportionate number of collisions relative to the number of drivers in this age group that are licenced to drive. This age group was involved in 10.1 percent of the reported collisions although it comprises only 7.2 percent of the licenced driving population.

* Ten and one-half percent of reported collisions involved one or more drivers who had been drinking.

* Alcohol was associated with a high proportion of collisions (38 percent) which occurred in the hours between 10 p.m. and 3 a.m. from Wednesdays to Sundays and in night-time collisions (24 percent of collisions between 6 p.m. and 6 a.m.).

Note: These figures are indicative of alcohol being present in the bloodstream of one or more of the drivers involved in the collision and do not necessarily suggest that alcohol was the proximate cause of the collision.

* Non-licenced drivers were less likely to be driving properly, and more likely to be under the influence of alcohol or drugs when involved in a collision.

* Motorcycle operators were more likely to be driving properly at the time of the collision and more likely to receive injuries if involved in a traffic collision.

* Children between 5 and 9 years of age were involved in a disproportionate number of pedestrian collisions (20.3%) compared with their proportion of the regional population (7.2%). Pedestrians in this age group were most frequently involved in a collision as the result of entering the roadway unexpectedly; that is, running into the roadway or entering the roadway from behind a parked vehicle or object.

* Vehicle defects were reported in 1 percent of the vehicles involved in collisions. It should be noted that the presence of a recorded vehicle defect does not necessarily suggest that it was the proximate cause of the collision.

1983 COMPARED WITH PREVIOUS YEARS

A comparison of the collision statistics for 1983 with those for previous years indicates noticable differences in four areas as follows.

1. **Overall Collisions**

Five percent fewer collisions occurred in 1983 than in 1982. The number of vehicle collisions occurring in the Regional Municipality of Hamilton-Wentworth was the lowest recorded for the Region (the Region was formed in 1974). Consistent with this reduction in collisions, the occurrence of injury collisions, persons injured and fatalities in the Region were all lower by between 3.2 percent and 25.9 percent compared to 1982.

2. **Bicycle Injuries**

The number of people injured in motor vehicle collisions while riding on a bicycle dropped from 254 in 1982, to 202 in 1983. For the years 1979, 1980 and 1981, by comparison, the number of cyclists involved in collisions was 190, 182 and 165 respectively. Decreases in the number of collisions were noted for all age groups under twenty-five years of age.

3. **Pedestrian Collisions Involving Five to Nine Year Olds**

Collisions involving five to nine year old pedestrians declined from 107 in 1982 to 79 in 1983, a decrease of twenty-six percent. For comparison, data for the years 1978 through 1981 were 146 collisions, 92 collisions, 90 collisions and 72 collisions respectively.

4. **Sixteen to Nineteen Year Old Involvement**

The 16 - 19 year old age group of drivers is much less likely to be driving properly when involved in a collision than the overall average. However, in 1983, this age group was involved in fewer collisions per capita than in 1982 and was no more likely to be involved in a collision than the 20 - 24 year old group.

In 1983, sixteen to nineteen year old drivers were involved in fewer motor vehicle collisions following the consumption of alcohol than in 1982. Collisions involving 16 year olds who had been drinking dropped from 8 to 1, and collisions involving 17 year olds who had been drinking dropped from 15 to 3.

Chapter One
Trends

General

Since 1951, the number of motor vehicle collisions and persons injured in motor vehicle collisions in Hamilton and Hamilton-Wentworth has increased (Exhibits 1-4, 1-5, 1-6). However, in the same time period, the population of the reporting area has approximately doubled and motor vehicle registrations have risen by a factor of 3 (Appendix Exhibit A-4). There is also evidence to suggest that, with an improving highway system, each registered vehicle is driven a greater distance annually. The effect of increased population, vehicle registration and vehicle use is increased opportunity for motor vehicle collisions to occur.

Normalizing the Data

To fairly assess historical trends, collision data should be expressed in terms of rate (normalized) through the use of one of several factors. Annual motor vehicle use information would provide the most accurate assessment of a motorist's exposure, and hence, likelihood of involvement in a collision. Motor vehicle registration data is somewhat less accurate as a normalizing factor, but is utilized since exposure information is not available. Rates based on registration data should be examined with caution, as the reliability of the registration information is unknown.

Population also provides a suitable and accurate normalizing factor. Exhibits 1-1, 1-2, 1-3 and associated analysis in this chapter refer to data which has been calculated on a population rate basis.

Collisions

The overall motor vehicle collision rate is shown in Exhibit 1-1. As of January 1, 1978, the reporting level for property damage only collisions was raised from $200.00 to $400.00. In 1983 the overall number of collisions was approximately 5 percent lower than in 1982.

Due to changes in the reporting criteria and reporting area for the period for which historical data are available, trend analysis of the number of collisions would not be appropriate or meaningful.

Personal injury collisions (Exhibit 1-1) show a significant (at the 99 percent level) decline from 1965 to 1983.

The results of this regression analysis and others for data in this chapter are included in Appendix Exhibit A-7.

Injuries

The personal injury rate graph (Exhibit 1-2), parallels the closely related injury collision graph (Exhibit 1-1). From 1951 to 1983 a significant increase in the personal injury rate is noted, while from 1963 to 1983 a slight decrease (statistically significant at the 95 percent level) is shown.

The rate of occurrence of pedestrian injuries (Exhibit 1-2) has demonstrated a modest but consistent decrease from 1951 to 1983.

Fatalities

In 1983, twenty persons died in motor vehicle collisions in Hamilton-Wentworth.

Since fatal collisions are rare events, small changes in the number of fatalities cause large fluctuations in the fatality rate (Exhibit 1-3). These fluctuations reduce the validity of statistical tests. Thus while the fatality rate for all collisions shows a slight downward trend, especially since 1968, this trend is not statistically significant. The overall fatality rate thus appears unchanged during the past 31 years. Comparable patterns are evident for Ontario and Canada (Appendix Exhibit A-5).

The fatality rate for pedestrians does display a reduction which is significant over the last 31 years.

Alcohol Involvement

When viewed as a proportion of overall collisions, statistics pertaining to alcohol involvement have remained quite constant over the period 1977 - 1983. The percentage of collisions in which one or more drivers was reported to have consumed alcohol has averaged approximately 12 percent. Nearly 22 percent of fatal collisions over the seven year period involved a drinking driver. The proportion of all drivers who had been drinking or were impaired when involved in a collision has dropped from 8.3 percent in 1978 to 6.6 percent in 1983, but the 19, 20 and 21 year old groups have involvement rates almost twice as high (see Exhibit 3-6). Viewed alternatively, 16 - 20 year olds comprise 10.0 percent of the Hamilton-Wentworth population and yet are involved in approximately 20 percent of collisions after consuming alcohol.

Exhibit 1-1

TRAFFIC COLLISION RATES - 1951 TO DATE
PERSONAL INJURY COLLISION RATES - 1954 TO DATE

Exhibit 1-2

PERSONAL INJURY RATES IN TRAFFIC COLLISIONS
1951 TO DATE

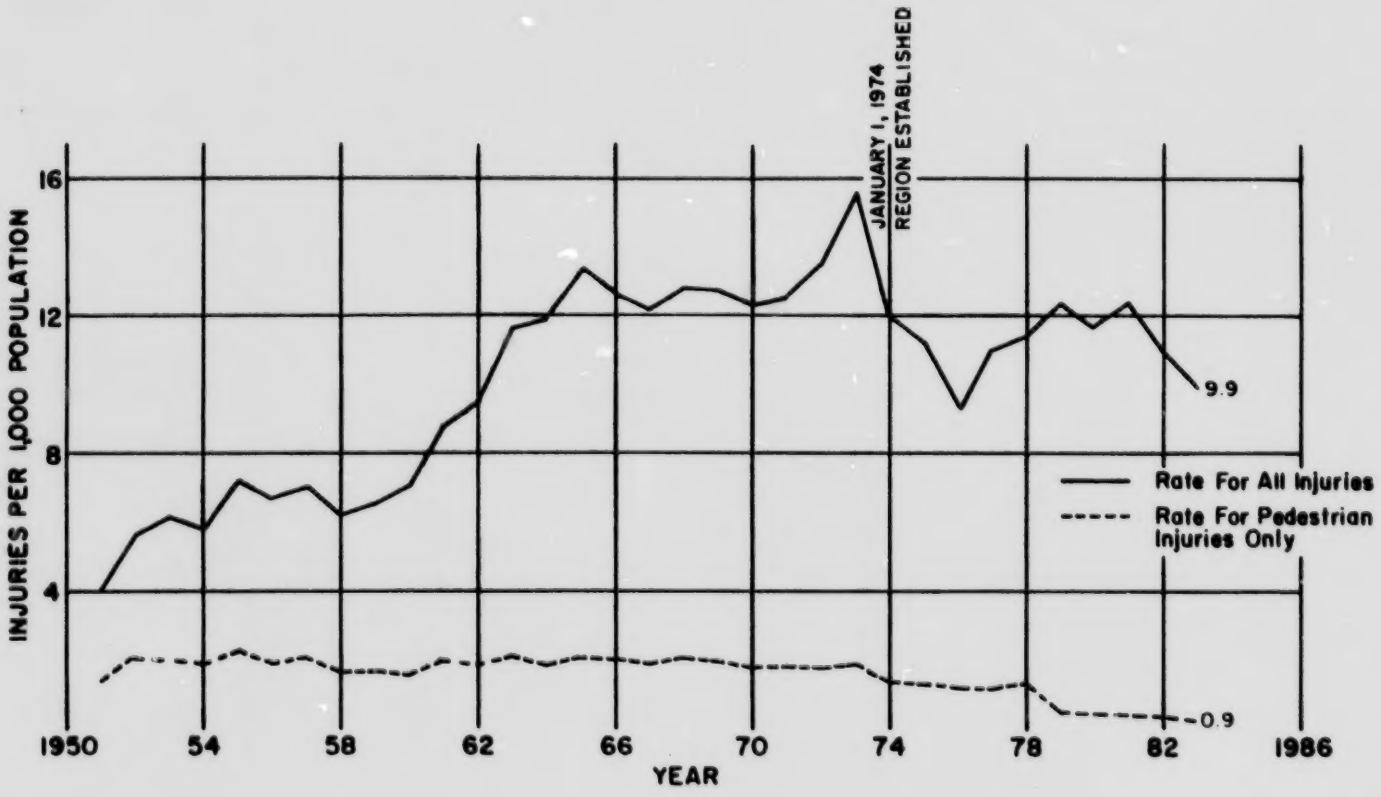


Exhibit 1-3

FATALITY RATES IN TRAFFIC COLLISIONS - 1951 TO DATE

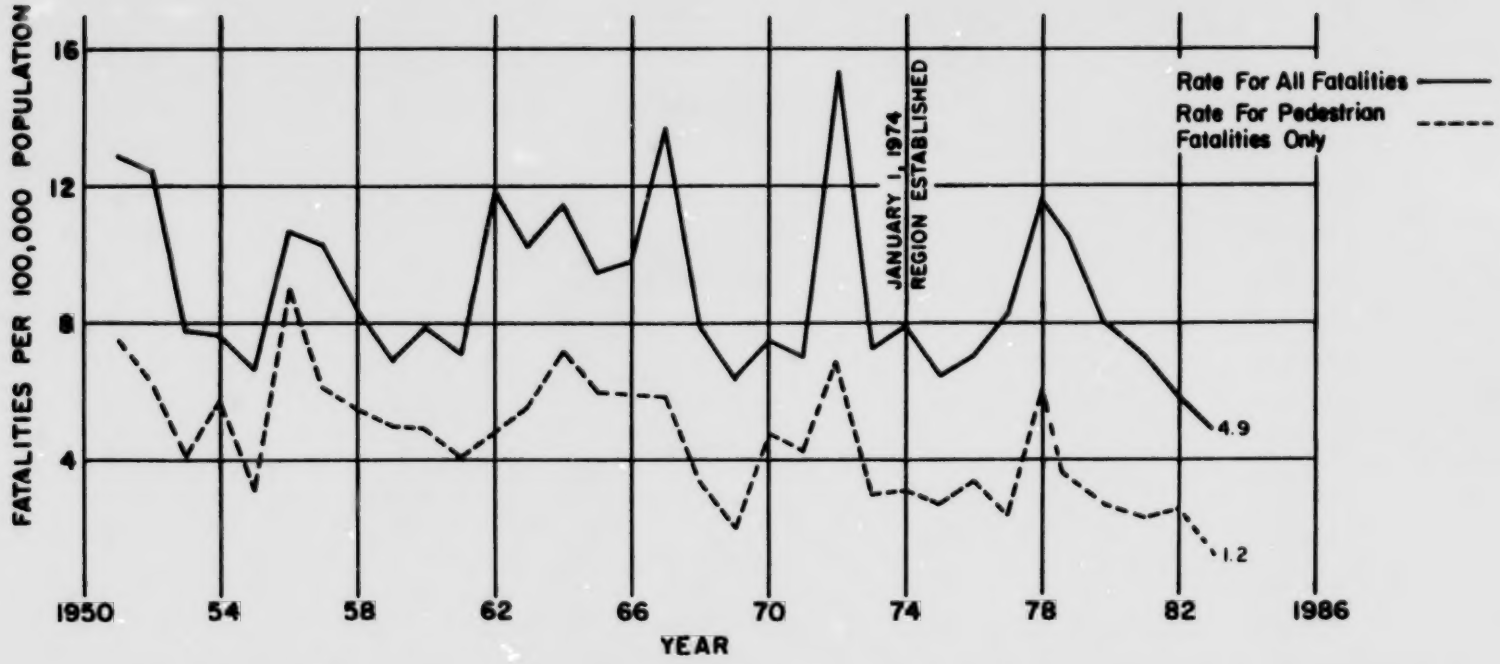


Exhibit 1-4

COLLISION STATISTICS - HISTORIC TRENDS

Year	Total No. of Collisions	Fatal Collisions	Injury Collisions	Property Damage Collisions	Estimated Total Property Damage ($)
1947	1,052	N/A	N/A	N/A	209,965
1948	1,351	N/A	N/A	N/A	312,170
1949	1,745	N/A	N/A	N/A	378,235
1950	2,304	N/A	N/A	N/A	522,535
1951	3,421	N/A	N/A	N/A	752,185
1952	4,219	N/A	N/A	N/A	892,329
1953	4,114	N/A	N/A	N/A	974,290
1954(a)	4,787	16	1,070	3,701	841,762
1955	6,691	13	1,297	5,381	1,014,339
1956	7,528	25	1,222	6,281	1,169,797
1957	7,973	25	1,376	6,572	1,382,399
1958	6,898	21	1,260	5,617	1,274,017
1959	7,189	18	1,337	5,834	1,388,015
1960	7,763	20	1,496	6,247	1,742,296
1961(a)	7,547	18	1,744	5,785	1,851,000
1962	8,338	28	1,904	6,406	2,160,000
1963	9,554	27	2,309	7,218	2,560,000

1964	9,948	32	2,455	7,461	2,886,000
1965	10,783	26	2,789	7,968	3,413,000
1966	9,950	27	2,757	7,166	3,521,000
1967	9,106	35	2,575	6,496	3,327,000
1968	8,983	21	2,547	6,415	4,449,000
1969	9,589	19	2,721	6,849	3,999,000
1970(a)	7,799	23	2,676	5,100	3,918,000
1971	7,314	22	2,821	4,471	4,647,000
1972	8,065	39	2,901	5,125	5,464,000
1973	8,499	23	3,143	5,333	6,208,000
1974(b)	9,599	29	3,364	6,206	7,886,000
1975	9,354	24	3,219	6,111	8,243,000
1976	9,146	28	2,816	6,302	9,262,000
1977	10,011	33	3,182	6,796	10,514,000
1978(a)	8,638	45	3,246	5,345	12,064,000
1979	8,798	39	3,389	5,370	13,325,000
1980	8,305	33	3,253	5,019	13,708,000
1981	8,660	28	3,398	5,234	15,536,040
1982	7,663	23	2,939	4,701	13,750,100
1983	7,268	20	2,839	4,409	13,924,500

(a) Collision reporting criteria changed (See Page 4).

(b) Reporting area expanded to include new areas patrolled by the Hamilton-Wentworth Regional Police.

Exhibit 1-5

PERSONAL INJURIES AND FATALITIES - HISTORIC TRENDS

Year	Total No. of Collisions	Persons Injured	Injury Rate/ 1,000 Pop.	Persons Killed	Death Rate/ 100,000 Pop.	Death Rate/ 10,000 Registered Vehicles
1947	1,052	563	N/A	26	N/A	N/A
1948	1,351	671	N/A	19	N/A	5.34
1949	1,745	738	N/A	29	N/A	N/A
1950	2,304	760	N/A	12	N/A	2.55
1951	3,421	815	4.0	26	12.9	5.13
1952	4,219	1,174	5.6	26	12.4	4.71
1953	4,114	1,322	6.1	17	7.8	2.84
1954(a)	4,787	1,304	5.8	17	7.6	2.71
1955	6,691	1,618	7.2	15	6.6	2.22
1956	7,528	1,570	6.7	25	10.7	3.57
1957	7,978	1,703	7.0	25	10.3	3.46
1958	6,898	1,573	6.2	21	8.4	2.77
1959	7,189	1,671	6.5	18	6.9	2.24
1960	7,763	1,871	7.1	21	7.9	2.54
1961(a)	7,547	2,311	8.7	19	7.1	2.22
1962	8,338	2,542	9.5	32	11.9	3.82
1963	9,554	3,075	11.6	27	10.2	3.03

1964	9,948	3,305	11.9	32	11.5	3.43	
1965	10,783	3,824	13.4	27	9.5	2.64	
1966	9,950	3,746	12.6	28	9.8	2.60	
1967	9,106	3,484	12.2	39	13.7	3.63	
1968	8,983	3,573	12.8	22	7.9	1.89	
1969	9,589	3,768	12.7	19	6.4	1.64	
1970(a)	6,759	3,717	12.3	23	7.5	2.00	
1971	7,314	3,876	12.5	23	7.0	1.91	
1972	8,065	4,055	13.5	46	15.3	3.42	(b)
1973	8,499	4,951	15.5	23	7.2	1.63	
1974(c)	9,599	4,678	11.9	31	7.9	2.00	(b)
1975	9,354	4,474	11.2	26	6.5	1.60	(b)
1976	9,146	3,811	9.3	29	7.1	1.78	(b)
1977	10,011	4,513	11.0	34	8.3	2.00	(b)
1978(a)	8,636	4,635	11.4	47	11.6	2.06	(d)
1979	8,798	4,923	12.1	42	10.3	2.20	(d)
1980	8,305	4,800	11.7	33	8.0	1.43	(d)
1981	8,660	5,015	12.3	31	7.6	1.16	(d)
1982	7,663	4,175	10.3	27	6.6	0.91	
1983	7,268	4,041	9.9	20	4.9	N/A	

(a) Collision reporting criteria changed (See Page 4).

(b) Registration estimated from total Ontario registrations.

(c) Reporting area expanded to include new areas patrolled by the Hamilton-Wentworth Regional Police.

(d) Registration data from licence information.

Exhibit 1-6

COLLISIONS WITH ALCOHOL INVOLVEMENT
HISTORIC TRENDS

Year	Total Number of Reported Collisions	Number of Alcohol-Related Motor Vehicle Collisions(a)	% Alcohol-Related	Total Number of Fatal Collisions	Total Number of Fatalities	Number of Alcohol-Related Motor Vehicle Fatal Collisions(a)
1977	10,011	1,175	11.7	33	34	5
1978	8,636	1,128	13.1	45	47	11
1979	8,798	1,139	12.9	39	42	5
1980	8,305	929	11.2	33	33	11
1981	8,660	1,053	12.2	28	31	8
1982	7,663	895	11.7	23	27	3
1983	7,268	765	10.5	20	20	5
TOTAL 1977-1983	59,341	7,084	11.9	221	234	48

(a) Includes drivers classified as impaired due to alcohol or classified as had been drinking.

(b) Section of Canadian Criminal Code.

Number of Drivers Impaired or Had Been Drinking	Number of Drivers Under 21 Years of Age Impaired or Had Been Drinking	% Under 21 Years of Age	Number of Charges Under Sections 234, 235, 236, 237 C.C.(b)	Number of Charges Under Sections 234-237 C.C. To Drivers Under 21 Years of Age	% Under 21 Years of Age	Year
1,179	241	20.4	364	54	14.8	1977
1,169	258	22.1	379	53	14.0	1978
1,194	264	22.1	382	59	15.4	1979
953	178	18.7	303	56	18.5	1980
1,269	208	16.4	369	49	13.3	1981
918	174	19.0	319	49	15.4	1982
775	144	18.6	241	35	14.5	1983
7,457	1,467	19.7	2,357	355	15.1	TOTAL 1977-1983

Exhibit 1-7

PEDESTRIAN AND CYCLIST INJURIES HISTORIC TRENDS

YEAR	PEDESTRIAN		BICYCLIST	
	Injuries	Fatalities	Injuries	Fatalities
1947	141	21	N/A	N/A
1948	204	13	N/A	N/A
1949	271	18	43	-
1950	239	11	69	1
1951	284	15	89	-
1952	448	13	116	1
1953	464	9	113	1
1954	439	13	129	1
1955	517	7	141	1
1956	447	21	123	1
1957	526	15	124	2
1958	446	14	100	2
1959	456	13	120	1
1960	422	13	120	2
1961	522	11	112	1
1962	495	13	126	1
1963	558	15	120	1
1964	526	20	120	-
1965	582	17	140	-
1966	618	17	132	1
1967	537	17	113	-
1968	588	10	84	1
1969	602	6	91	2
1970	586	14	101	1
1971	570	13	155	2
1972	530	21	156	2
1973	569	9	197	1
1974(a)	555	13	192	3
1975	513	11	235	-
1976	480	14	195	-
1977	503	10	193	3
1978	542	25	162	1
1979	464	15	177	4
1980	434	12	178	1
1981	458	10	159	1
1982	396	10	252	2
1983	387	5	200	2

(a) Reporting area expanded to include new areas patrolled by the Hamilton-Wentworth Regional Police.

Chapter Two
Selected Characteristics

Injuries

Of the 20,431 persons involved in collisions, 4,041 received injuries. The chance of an involved person sustaining an injury in a collision varied from a 16 percent chance for a motor vehicle rider or passenger to a 100 percent chance for a pedestrian (Exhibit 2-1). Although the risk of injury would appear to be significantly higher for motorcyclists, bicyclists and pedestrians, this phenomenum is partially or wholly explained by the reporting criteria. It is unlikely that a cyclist or pedestrian would be involved in a collision that resulted in over $400.00 damage without the cyclist or pedestrian being injured. Small or exposed vehicles such as bicycles also afford less protection in a collision.

Seatbelts

Although motor vehicle seatbelts were reported as being in use for 90 percent of involved drivers (Exhibit 2-2), field observations taken by the Province of Ontario in 1978 (2.1) suggest an actual usage rate for drivers in the order of 65 percent. This discrepancy could be interpreted to mean that a higher proportion of seatbelt users were involved in collisions, but is more likely to indicate an over-statement of seatbelt usage by persons involved in collisions. The involved individual may be concerned about receiving a summons for failure to wear his or her seatbelt or may be concerned about additional financial or civil responsibilities caused by failure to wear belts at the time of the collision.

It is estimated that in Hamilton-Wentworth in 1983, 1,200 persons would have received less severe injuries had they been wearing their seatbelts. Ontario statistics (2.2) indicate increased medical and hospital costs for unbelted persons involved in collisions.

Motorcycle Injuries

Eighty-six percent of motorcyclists involved in collisions received injuries, compared to 20 percent of all persons involved in collisions. This is indicative of the limited protection afforded to motorcycle riders involved in a collision.

Sixty-seven of 202 (33%) motorcyclists involved in collisions were reported as not wearing helmets, despite the Provincial law mandating helmet use (Exhibit 2-3).

Helmet use did not appear to have an effect on the likelihood of a motorcyclist being injured in a collision. Helmets are intended to prevent head injury, but in a serious collision, the motorcycle rider is equally likely to receive injuries to other parts of the body.

Damages

Total damages in collisions in Hamilton-Wentworth amounted to a sum of approximately 14 million dollars (Exhibit 2-4), which includes damage to vehicles and property but does not include medical and hospital expenses, loss of income, or loss of future earnings. The estimated cost of property damage of each collision was $1,916 with 53 percent of the vehicles involved sustaining damage in excess of $600 (Exhibit 2-5). When the costs of medical attention, lost income and other effects are considered, the total cost of each collision may exceed $6,500 (2.3).

Times of Occurrence

A close similarity between the occurrence of collisions and traffic volumes on a time of day basis (Exhibit 2-6), was observed. However, the collision rate (in terms of traffic volume) was greater than the daily average during the period from midnight to 5 a.m., when 760 or 10.5 percent of all collisions occurred.

The pattern of collision occurrences by time of day and day of week was summarized (Exhibit 2-7 and Exhibit 2-8), and distinct differences were found in the pattern of collision occurrence.

The explanation for variations in patterns of collisions by time of day and day of week may be associated with difference in travel patterns which change during the week due to the frequency of shopping or personal trips, or with psychological factors such as different drinking and stress patterns that might influence collision involvement.

The pattern of collision occurrences was compared on a month of year basis (Exhibit 2-9) and there was a difference between the number of collisions which occurred each month. The higher number of collisions occurring during the winter months is probably primarily due to drivers not adjusting to adverse weather and roadway conditions.

Impact Types

The type of initial impact was compared with the injury classification of the collisions (Exhibit 2-10) and it was determined (at the 95 percent level) that the probability of injury was not the same for all initial impact types.

The chance of being injured in an approaching or single motor vehicle collision was 53 to 55 percent compared to a 17 to 46 percent chance for other collision types. However, fewer approaching and single motor vehicle collisions resulted in injuries or fatalities (893 versus 1,996) than other collision types.

Impact Types (Cont'd)

Greater than one half of all collisions were in intersections or associated with intersections (Exhibit 2-11). Twenty-seven percent of collisions occurred at signalized intersections, and 21 percent at stop- or yield-controlled intersections (Exhibit 2-12).

Over one half of all collisions occurred at locations with no form of traffic control.

REFERENCES

2.1 Based on surveys conducted by the Ministry of Transportation and Communications of Ontario, July 1978.

2.2 Ontario Ministry of Health: The cost of hospital and medical treatment for a person injured while wearing seatbelts is $282; for those not wearing belts, $419.

2.3 J. J. Lawson, in "The Cost of Road Accidents and Their Application in Economic Evaluation of Safety Programs" estimated that, in 1978, the average cost of a motor vehicle collision was $4,500.00 for the direct costs of property damage, lost productive work and health care costs only. Increased at a rate comparable to inflation, this estimate would be approximately $6,900.00 per collision in 1983.

Exhibit 2-1 **INJURY STATUS OF ALL PERSONS INVOLVED**

Category	Persons Involved	Persons Injured or Killed	Injuries/ Involved	TYPE OF INJURY Fatal	Major	Minor	Minimal
Driver	12,172	2,171	0.18	11	129	777	1,254
Bicyclist	202	195	0.97	2	15	77	101
Rider/Passenger	7,665	1,283	0.16	2	65	429	787
Pedestrian	392	392	1.00	5	68	191	128
Totals	20,431	4,041	0.20	20	277	1,474	2,270

THERE WAS APPROXIMATELY A 2 IN 10 CHANCE THAT A PERSON INVOLVED IN A TRAFFIC COLLISION WOULD BE INJURED.

FOR EVERY 20 RESIDENTS OF THE REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH, APPROXIMATELY 1 PERSON WAS INVOLVED IN A MOTOR VEHICLE COLLISION IN 1983.

Exhibit 2-2

DRIVER INJURY STATUS VS SAFETY EQUIPMENT IN USE

Driver Injury Status	SAFETY EQUIPMENT IN USE				
	All	Pelvic Only	None	Unknown	Total
None	8,978	203	342	492	10,015
Minimal	1,082	29	99	45	1,255
Minor	605	20	85	67	777
Major	69	1	28	30	128
Fatal	3	-	4	4	11
Total	10,737	253	558	638	12,186

DRIVERS WHOSE SEAT BELT USAGE WAS RECORDED	12,186
TOTAL DRIVERS WEARING PELVIC AND/OR SHOULDER BELTS	10,990
RECORDED DRIVER BELT USAGE	90.2%

THE REPORTED SEAT BELT USAGE RATE FOR DRIVERS INVOLVED IN COLLISIONS WAS 90%

Exhibit 2-3

MOTORCYCLE DRIVER INJURIES

Injury	Helmet in Use: Yes		No	Not Known	Total
None	12	(50.0) (a)	12	4	28
Minimal	33	(60.0)	22	3	58
Minor	53	(66.3)	27	3	83
Major	21	(80.8)	5	-	26
Fatal	1	(50.0)	1	-	2
Unknown	-	(-)	-	5	5
Totals	120	(64.2)	67	15	202

86% OF MOTORCYCLE DRIVERS INVOLVED IN COLLISIONS FOR WHICH INJURY STATUS WAS RECORDED RECEIVED INJURIES. THE LIKELIHOOD OF INJURY WAS SIMILAR FOR HELMET USERS AND NON USERS (HELMETS OFFER PROTECTION ONLY FOR HEAD AND NECK INJURIES).

36% OF MOTORCYCLISTS INVOLVED IN COLLISIONS WERE RECORDED AS NOT WEARING SAFETY HELMETS.

(a) Numbers in brackets are percentages of row totals. Percentages exclude unknown helmet use.

Exhibit 2-4 **PROPERTY DAMAGE ESTIMATES (a)**

	Total	Average per Collision
Damage to Vehicles	$13,331,200.	$1,834.
Damage to Other Property	593,300.	82.
All Damage	13,924,500.	1,916.

THE AVERAGE DAMAGE FOR EACH REPORTED COLLISION WAS $1,916.

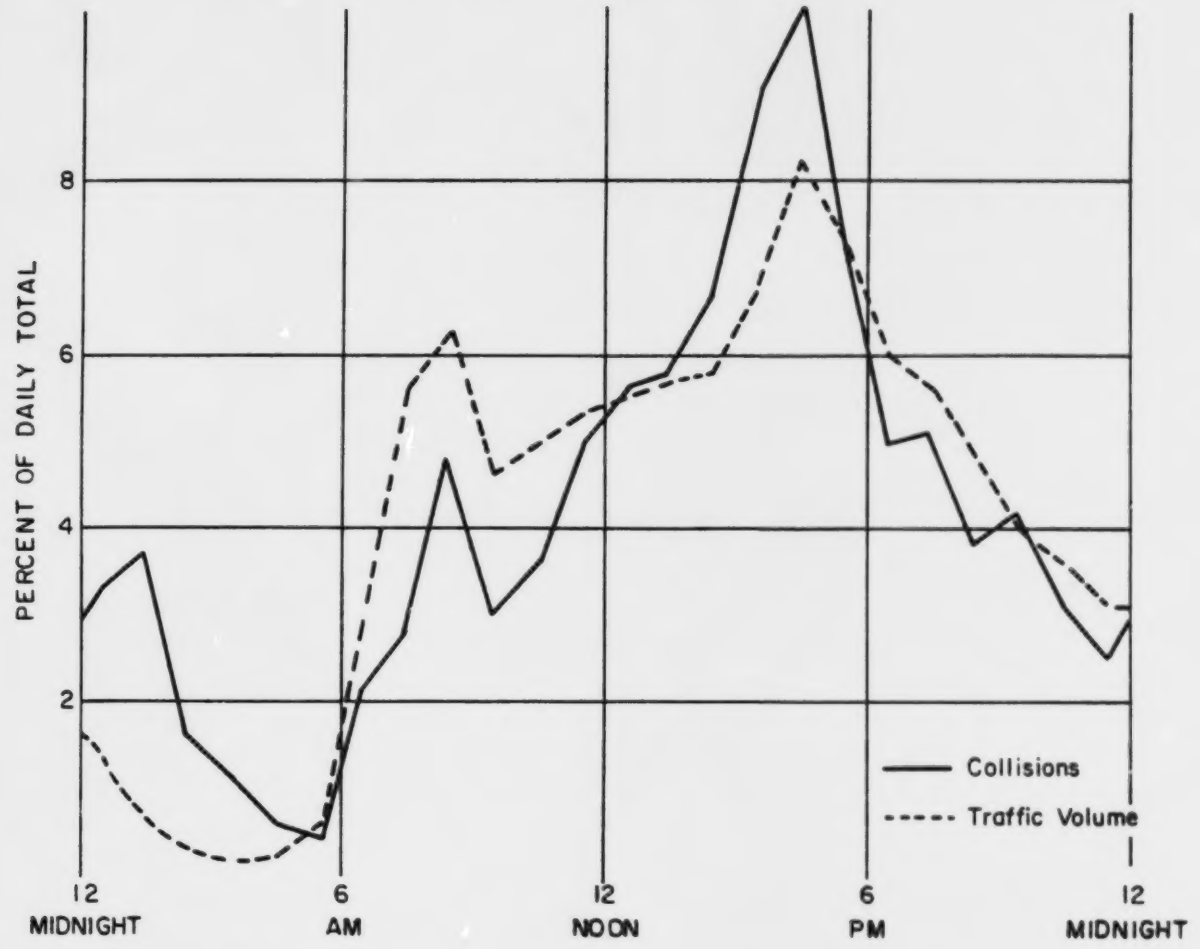
Exhibit 2-5 **ESTIMATED DAMAGE TO MOTOR VEHICLES (a)**

Damage	No. of Vehicles	% Of All Vehicles Involved
None	1,482	10.8
$0 - 199	1,248	9.1
$200 - 399	1,521	11.1
$400 - 599	2,147	15.7
$600 - 999	2,327	17.0
$1,000 - 1,999	2,829	20.7
$2,000 - 3,999	1,656	12.1
$4,000 and over	476	3.5
	13,686	100.0

OVER 53% OF THE VEHICLES INVOLVED IN COLLISIONS EXPERIENCED DAMAGE IN EXCESS OF $600.

(a) As estimated at the scene of the collision.

TIME OF DAY VS COLLISIONS AND TRAFFIC VOLUME



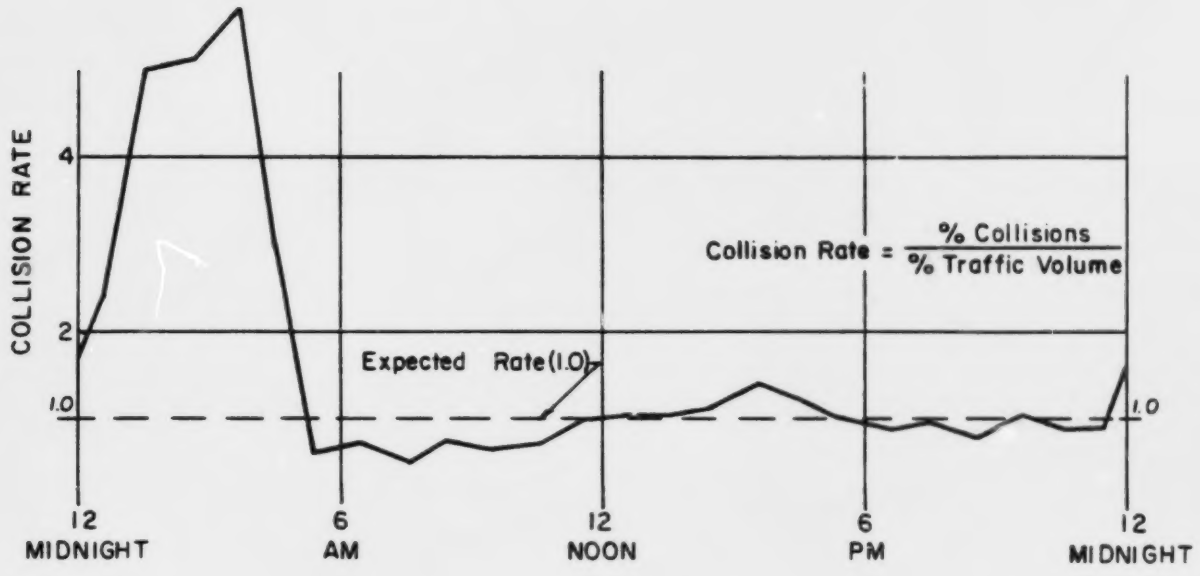


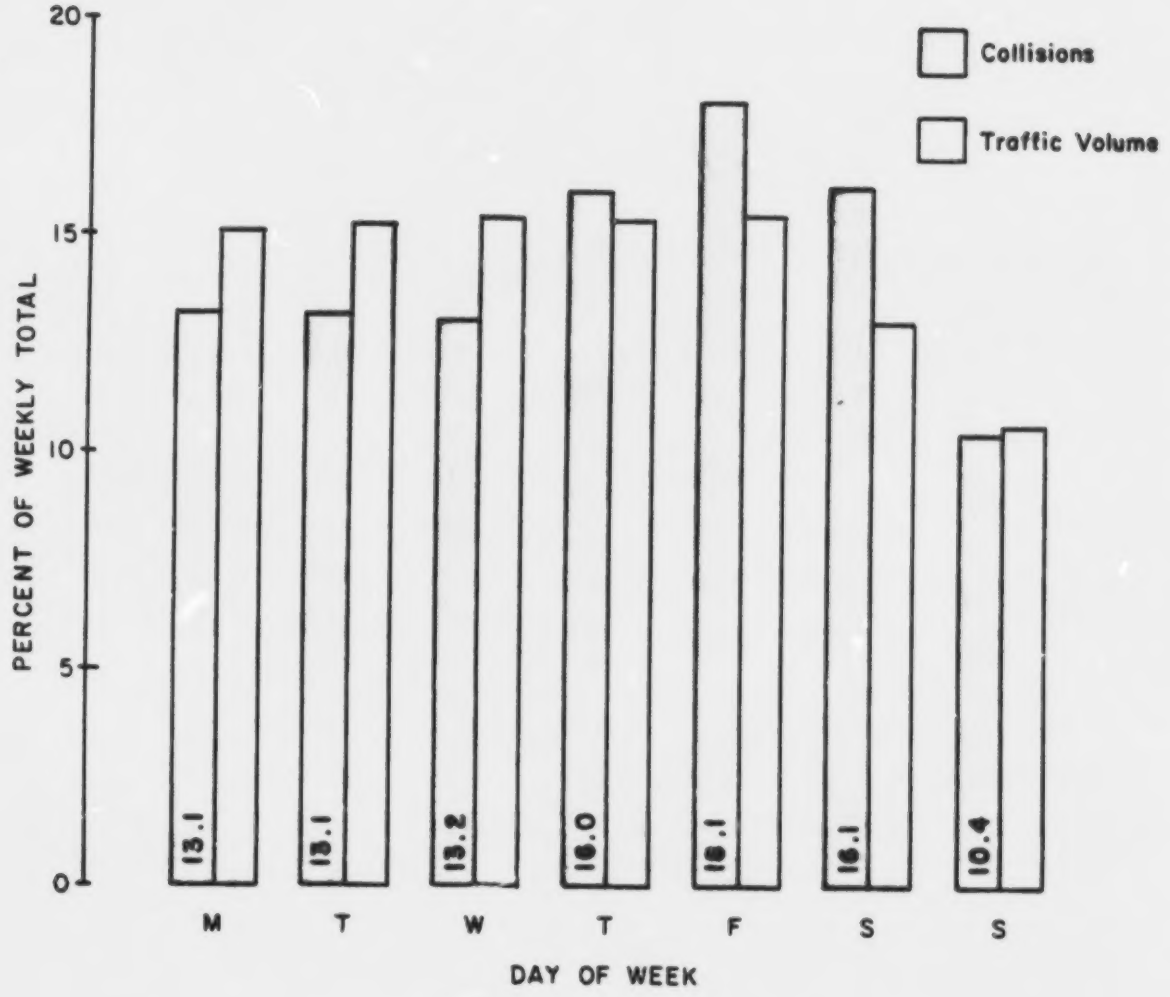
Exhibit 2-7

COLLISION OCCURRENCES BY TIME OF DAY AND DAY OF WEEK

Time	MON	TUES	WED	THUR	FRI	SAT	SUN	TOTALS	(%)
12 - 1 a.m.	18	19	22	22	41	58	59	239	(3.3)
1 - 2 a.m.	5	17	22	23	31	98	73	269	(3.7)
2 - 3 a.m.	2	11	7	8	23	50	25	126	(1.7)
3 - 4 a.m.	4	2	5	6	10	26	29	82	(1.1)
4 - 5 a.m.	3	3	4	4	6	9	15	44	(0.6)
5 - 6 a.m.	1	5	3	6	5	5	5	30	(0.4)
6 - 7 a.m.	38	19	32	18	23	10	12	152	(2.1)
7 - 8 a.m.	36	28	36	36	42	15	9	202	(2.8)
8 - 9 a.m.	78	46	61	56	65	31	10	347	(4.8)
9 - 10 a.m.	31	41	38	36	34	26	14	220	(3.0)
10 - 11 a.m.	34	41	43	37	49	40	21	265	(3.6)
11 - 12 noon	59	44	42	54	65	62	34	360	(5.0)
12 - 1 p.m.	55	52	64	54	61	82	40	408	(5.6)
1 - 2 p.m.	48	47	57	57	94	71	37	411	(5.7)
2 - 3 p.m.	62	61	68	81	87	76	50	485	(6.7)
3 - 4 p.m.	97	105	103	136	98	77	49	665	(9.1)
4 - 5 p.m.	110	127	86	146	124	78	45	716	(9.9)
5 - 6 p.m.	72	79	67	101	82	80	51	532	(7.3)
6 - 7 p.m.	37	60	47	66	66	54	33	363	(5.0)
7 - 8 p.m.	53	50	48	58	75	57	30	371	(5.1)
8 - 9 p.m.	40	25	24	50	65	47	22	273	(3.8)
9 - 10 p.m.	33	34	37	50	77	38	34	303	(4.2)
10 - 11 p.m.	24	30	18	37	47	38	28	222	(3.1)
11 - 12 a.m.	14	9	22	23	45	42	28	183	(2.5)
Totals	954	955	956	1,165	1,315	(1,170)	753	7,268	(100.0)
%	(13.1)	(13.1)	(13.2)	(16.0)	(18.1)	(16.1)	(10.4)		

THE HIGHEST ONE HOUR COLLISION PERIOD WAS THURSDAY BETWEEN 4 P.M. AND 5 P.M.

DAY OF WEEK VS COLLISIONS AND TRAFFIC VOLUME



THE HIGHEST COLLISION RATE (a) OCCURRED ON SATURDAYS

(a) RATE = $\frac{\%\ \text{COLLISIONS}}{\%\ \text{VOLUME}}$

Exhibit 2-9

MONTH OF YEAR OF OCCURRENCE OF COLLISIONS

Month	Number of Collisions	Percentage of Total Collisions
January	582	8.0
February	462	6.4
March	632	8.7
April	456	6.3
May	624	8.6
June	615	8.5
July	479	6.6
August	578	8.0
September	559	7.7
October	701	9.6
November	782	10.8
December	798	11.0
	7,268	100.0

THE HIGHEST NUMBER OF COLLISIONS OCCURRED IN THE MONTH OF DECEMBER.

Exhibit 2-10

INITIAL IMPACT TYPE VS CLASSIFICATION

Classification

Initial Impact Type	A Fatal Injury No.	%	B Non-Fatal Injury No.	%	C Property Damage Only No.	%	D All Collisions No.	%	Column A + B / Column D
Rear End	2	(10.0)	735	(25.9)	821	(18.6)	1,558	(21.4)	0.47
Angle	4	(20.0)	779	(27.4)	1,398	(64.1)	2,181	(30.0)	0.36
Turning	1	(5.0)	310	(10.9)	675	(15.3)	986	(13.6)	0.32
Sideswipe	-	(-)	151	(5.3)	720	(16.3)	871	(12.0)	0.17
Approaching	4	(20.0)	328	(11.6)	296	(6.7)	628	(8.6)	0.53
Single Motor Vehicle	9	(45.0)	552	(18.4)	490	(11.1)	1,021	(14.0)	0.55
Other	-	(-)	14	(0.5)	9	(0.2)	23	(0.3)	0.61
	20	(100.0)	2,869	(100.0)	4,409	(100.0)	7,268	(100.0)	

51% OF THE INITIAL IMPACTS RECORDED WERE "ANGLE" AND "REAR END".

THE PROBABILITY OF FATALITY OR OF INJURY WAS HIGHEST IN APPROACHING OR SINGLE VEHICLE COLLISIONS

Exhibit 2-11

INITIAL IMPACT TYPE VERSUS ROAD LOCATION

	Road Location								
Impact Type	Non-Intersection	Intersection Related	In Intersection	At Private Drive	At Railroad	Underpass or Tunnel	Overpass or Bridge	Other	Totals
Rear End	633	553	242	116	4	1	7	2	1,558
Angle	478	286	1,088	310	7	-	7	5	2,181
Turning	129	187	529	139	-	-	1	1	986
Sideswipe	492	158	130	78	1	4	6	2	871
Approaching	266	91	227	37	3	-	4	-	628
Single Motor Vehicle	624	178	150	46	3	4	9	7	1,021
Other	11	2	3	5	1	-	-	1	23
TOTALS	2,633	1,455	2,369	731	19	9	34	18	7,268
%	(36.2)	(20.0)	(32.6)	(10.1)	(0.3)	(0.1)	(0.5)	(0.2)	(100.0)

53% OF COLLISIONS WERE IN, OR ASSOCIATED WITH INTERSECTIONS

Exhibit 2-12

INITIAL IMPACT TYPE VERSUS TYPE OF TRAFFIC CONTROL

	Type of Traffic Control								
Impact Type	Operating Traffic Signal	Operating Stop Sign	Operating Yield Sign	Police Control	School Guard	School Bus	No Control	Other	Totals
Rear End	507	158	24	-	4	2	856	7	1,558
Angle	600	713	13	-	-	-	849	6	2,181
Turning	419	218	5	-	-	-	344	-	986
Sideswipe	158	117	-	-	-	2	592	2	871
Approaching	140	173	8	-	-	1	299	7	628
Single Motor Vehicle	156	117	8	-	2	-	721	17	1,021
Other	2	5	-	-	-	-	16	-	23
TOTALS	1,982	1,501	58	-	6	5	3,677	39	7,268
%	(27.3)	(20.7)	(0.8)	(-)	(0.1)	(0.1)	(50.6)	(0.5)	(100.0)

GREATER THAN ONE-HALF OF ALL COLLISIONS (51%) OCCURRED AT LOCATIONS WITH NO TRAFFIC CONTROL.

Chapter Three
Drivers

Driver Age

Although sixteen to nineteen year olds make up only 7 percent of the licenced driving population, this age group was involved in 10.2 percent of reported collisions (Exhibit 3-1).

Drivers under 22 involved in collisions were less likely to have been driving properly at the time of the collision (Exhibit 3-2). Younger drivers involved in collisions were more likely to have committed improper driving actions resulting from poor judgement or lack of maturity. Frequent improper driver actions for this age group were "speed too fast", "loss of control of the vehicle", "failure to yield the right-of-way" and "following too close". Drivers over 65 years of age involved in collisions were more likely to have committed infractions involving non-compliance with traffic regulations such as "failure to yield the right-of-way" or "improper turn".

Drinking Drivers

Drinking drivers were involved in 10.5 percent of all reported collisions, 25.0 percent of the fatal and 14.2 percent of the injury collisions (Exhibit 3-3). There was a 35 percent greater chance of an injury occurring in a collision which involved a driver who had been drinking. Drivers reported as impaired had relatively constant probability of involvement in injury-causing or property damage only collisions.

Exhibit 3-4 indicates that 38 percent of the collisions which occurred during the period from 10 p.m. to 3 a.m. from Wednesdays to Sundays involved drinking drivers.

Exhibit 3-5 indicates that less than 15 percent of the drivers involved in collisions who had been drinking or were impaired were driving properly at the time of the collision and the most frequently indicated improper driver action was loss of control of the vehicle.

Eighteen, nineteen, twenty and twenty-one year old age groups had above average likelihood of being under the influence of alcohol at the time of a collision (Exhibit 3-6).

Hit and Run Collisions

In 1983 there were 849 hit and run collisions involving 852 hit and run drivers, of which 42 percent were subsequently apprehended (Exhibit 3-7). The hit and run collision is more likely to be of a "property damage" classification (Exhibit 3-8).

Non-Licenced Drivers

It was determined that the non-licenced driver, including those whose licence was under suspension, was more likely to be involved in a fatal or injury collision (Exhibit 3-9) and also more likely to be under the influence of alcohol at the time of the collision (Exhibit 3-10). The non-licenced driver was also more likely to have been driving too fast for roadway conditions at the time of the collision (Exhibit 3-11).

Exhibit 3-12 indicates that 56 percent of the collisions involving a non-licenced driver occurred between 6 p.m. and 6 a.m. whereas only 35 percent of all collisions occurred during this period. The exhibit also indicates that 80 percent of the alcohol-related collisions occurred during this period. The 6 p.m. to 6 a.m. period is characterized by high alcohol involvement, high involvement of non-licenced drivers and high collision involvement rate.

Moving Violations

The Regional Police Department issued over 50,000 moving violation summonses in 1983 and this effort at reducing traffic collisions by selective enforcement is recognized. However, it was determined that, in many cases, enforcement was directed at violations that do not relate proportionately to violations indicated in traffic collisions. This could indicate that the enforcement effort is very successful in that it eliminates collisions of related types. However, this may be an indication that a portion of the enforcement effort is directed at moving violations that are readily enforceable (Exhibit 3-13). It is recognized that some violations involved in collisions are difficult to enforce or represent an unfeasible countermeasure to collision occurrences. For example, "following too close" was indicated in 17.3 percent of the improper driving actions and "failure to yield the right-of-way" was indicated in 24.3 percent of improper driving actions. The former is difficult to enforce in the absence of a collision, and it is unfeasible to enforce the latter. Selective enforcement nonetheless is a recognized collision countermeasure technique for other types of moving violations.

Motorcycles

The proportion of motorcycle drivers involved in collisions driving properly in most age groups is higher than the proportion for other motor vehicle drivers for the same age groups (Exhibit 3-14). This exhibit also indicates that the most frequent improper driver action for motorcyclists was "lost control".

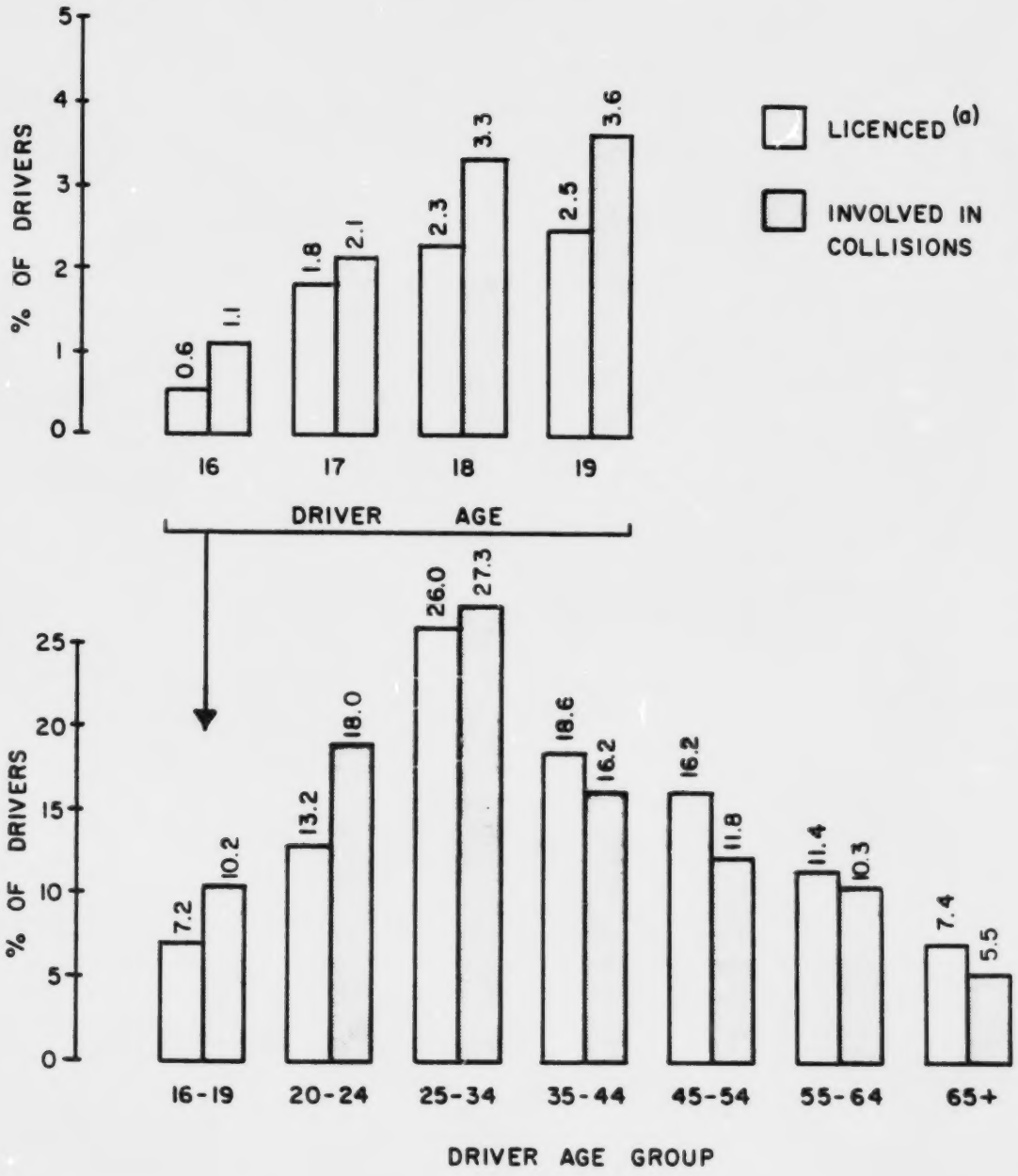
Motorcycles (Cont'd)

Without more refined data on exposure of motorcyclists in traffic under non-collision circumstances, the significance of a higher proportion of involved motorcycle drivers driving properly in a collision cannot be specifically determined. It could be hypothesized that a motorcycle operator is particularly prone to being involved in a collision when driving properly or alternatively, that the motorcycle operator is particularly adept in avoiding a collision for which he or she would have been responsible.

Bicycles

It was determined that responsibility for a collision involving a bicyclist decreased with increased bicyclist age and that 30 percent or less of bicyclists under 15 involved in collisions were recorded as driving properly (Exhibit 3-15). The most predominant known cyclist improper action indicated was "failure to yield the right-of-way" but instances of disobeying other traffic laws were also prominent.

LICENCED MOTOR VEHICLE DRIVER AGE VS COLLISION INVOLVEMENT



16 TO 24 YEAR OLD DRIVERS WERE INVOLVED IN MORE COLLISIONS PER LICENCED DRIVER THAN ANY OTHER AGE GROUP.

(a) Licenced in the Province of Ontario.

Exhibit 3-2

MOTOR VEHICLE DRIVER AGE VS DRIVER ACTION

Driver Action	0-4	5-9	10-14	15	16	17	18	19	20	21	22
Driving Properly	-	-	-	-	35	78	136	176	206	221	228
Following Too Close	-	-	-	-	4	36	44	45	39	45	41
Speed Too Fast	-	-	-	-	5	11	18	14	22	12	10
Improper Turn	-	-	-	-	11	22	19	15	17	18	20
Disobey Traffic Signal	-	-	-	-	4	4	11	12	8	10	7
Disobey Stop Sign	-	-	-	-	4	10	10	6	9	14	7
Fail to Yield R.O.W.	-	-	-	-	20	30	41	45	45	46	29
Improper Passing	-	-	-	-	1	1	5	5	3	9	5
Lost Control	-	-	2	3	31	32	60	52	51	45	39
Wrong Way One-Way Street	-	-	-	-	-	-	-	2	1	-	-
Not Known	-	-	2	2	10	8	20	13	31	29	28
Other	-	1	1	-	13	25	42	41	38	47	37
Disobey Other Control	-	-	-	-	2	1	-	-	-	2	2
Totals	-	1	4	5	140	258	407	435	470	498	453
% Drivers involved driving properly(a)	-	-	-	-	29.9	34.7	39.4	46.2	51.4	52.4	58.8

(a) Excluding "Not Known" and "Other".

23	24	25-34	35-44	45-54	55-64	65-74	75 +	Totals	%	Driver Action
224	211	1,761	1,072	745	601	197	40	5,931	(49.0)	Driving Properly
52	37	261	134	100	92	20	7	963	(7.9)	Following Too Close
10	5	39	22	4	5	1	1	180	(1.5)	Speed Too Fast
30	21	161	92	87	104	53	18	697	(5.7)	Improper Turn
11	9	53	48	34	33	25	9	278	(2.2)	Disobey Traffic Signal
7	4	46	26	21	19	15	1	199	(1.6)	Disobey Stop Sign
28	29	327	218	193	158	101	31	1,352	(11.1)	Fail to Yield R.O.W.
4	7	18	17	14	14	4	-	107	(0.9)	Improper Passing
35	25	218	93	62	55	20	10	832	(6.8)	Lost Control
-	1	6	3	1	2	2	1	19	(0.2)	Wrong Way One-Way Street
23	24	197	104	68	71	31	8	670	(5.5)	Not Known
30	27	216	128	103	87	49	9	893	(7.3)	Other
1	3	12	11	5	9	3	-	51	(0.4)	Disobey Other Control
465	403	3,315	1,968	1,437	1,250	527	136	12,172	(100.0)	Totals
54.4	59.9	60.7	61.8	58.8	55.0	44.1	33.6	55.9		% Drivers involved driving properly (a)

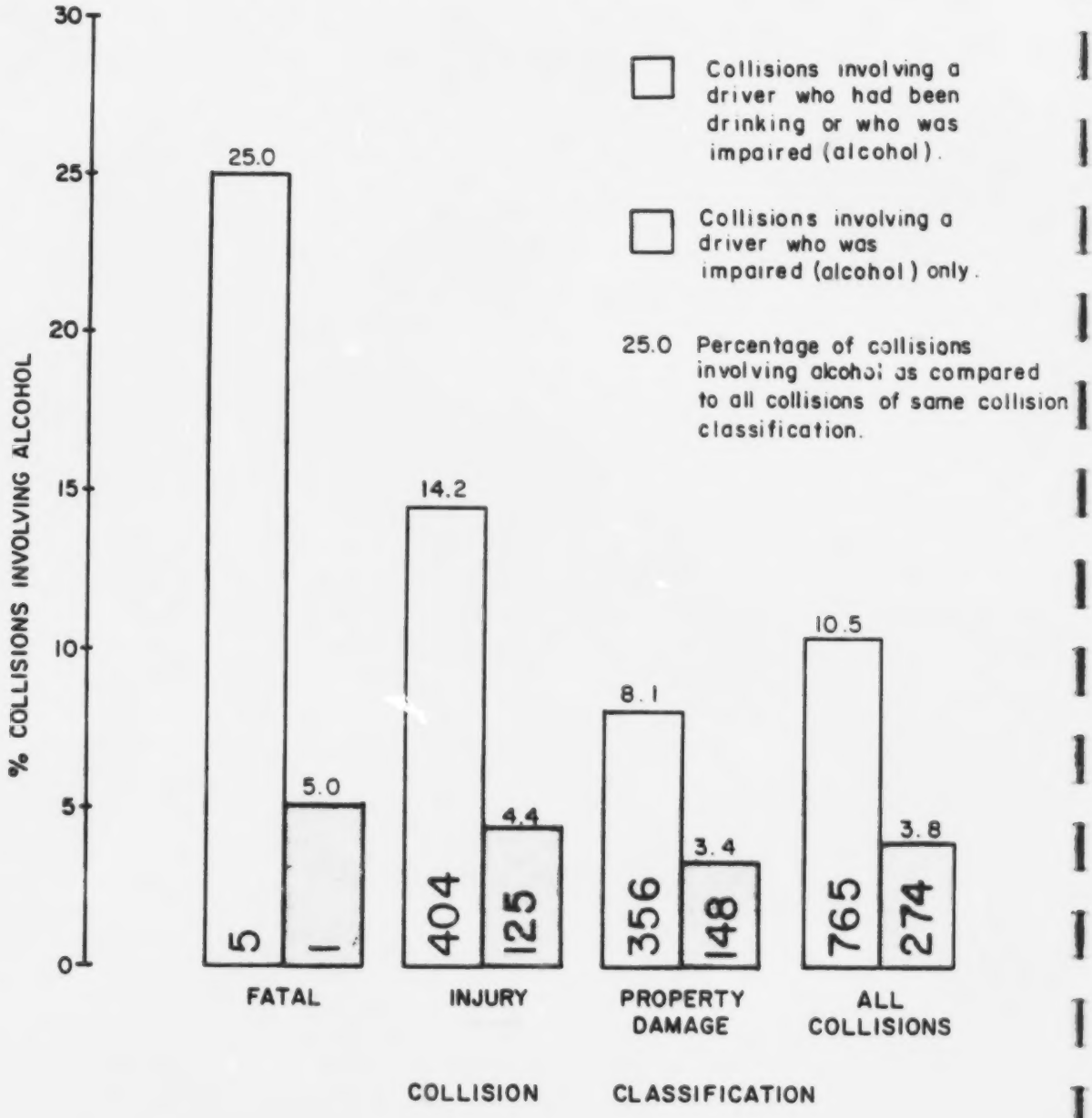
THE OVERALL PERCENTAGE OF DRIVERS DRIVING PROPERLY WAS 55.9%. THE PERCENTAGE OF DRIVERS DRIVING PROPERLY FOR DRIVER AGE GROUPS UNDER 20 AND OVER 64 WAS LESS THAN 50%.

THE MOST FREQUENT RECORDED IMPROPER DRIVING ACTION WAS FAILING TO YIELD RIGHT-OF-WAY.

Exhibit 3-3

1983 Hamilton-Wentworth Collision Report

ALCOHOL INVOLVEMENT VS COLLISION CLASSIFICATION



COLLISIONS IN WHICH AN INJURY OR FATALITY OCCURRED WERE MORE LIKELY TO INVOLVE A DRIVER WHO HAD BEEN DRINKING THAN PROPERTY DAMAGE ONLY COLLISIONS.

IMPAIRED DRIVERS HAD RELATIVELY EQUAL INVOLVEMENT IN ALL CLASSIFICATIONS OF COLLISIONS.

Exhibit 3-4

TIME OF DAY AND DAY OF WEEK OF COLLISIONS INVOLVING ALCOHOL

Time of Day	MON	TUES	WED	THUR	FRI	SAT	SUN	TOTAL
12 - 1 a.m.	8	3	4	9	15	15	24	78
1 - 2 a.m.	1	9	12	11	12	45	38	128
2 - 3 a.m.	2	3	-	4	9	20	13	51
3 - 4 a.m.	-	1	2	-	3	11	8	25
4 - 5 a.m.	1	1	-	-	3	5	6	16
5 - 6 a.m.	-	-	-	1	2	2	4	9
6 - 7 a.m.	-	1	-	1	1	3	-	6
7 - 8 a.m.	-	-	1	-	2	1	-	4
8 - 9 a.m.	-	-	-	-	-	1	-	1
9 - 10 a.m.	-	-	-	-	-	1	-	1
10 - 11 a.m.	-	-	1	-	-	-	1	2
11 - 12 noon	-	-	1	-	1	3	-	5
12 - 1 p.m.	-	-	2	-	-	4	3	9
1 - 2 p.m.	-	2	2	2	2	1	3	12
2 - 3 p.m.	3	4	2	2	2	7	2	22
3 - 4 p.m.	3	1	2	4	6	1	2	19
4 - 5 p.m.	5	7	1	5	6	4	6	34
5 - 6 p.m.	-	4	3	9	8	9	8	41
6 - 7 p.m.	3	8	5	6	10	11	3	46
7 - 8 p.m.	9	2	10	9	10	8	3	51
8 - 9 p.m.	8	2	3	2	10	14	3	42
9 - 10 p.m.	7	4	9	8	10	3	4	45
10 - 11 p.m.	6	6	5	11	10	14	8	60
11 - 12 midnight	2	2	6	7	15	16	10	58
Totals	58	60	71	91	137	199	149	765

38% OF THE COLLISIONS WHICH OCCURRED DURING THE PERIOD FROM 10:00 P.M. TO 3:00 A.M., WEDNESDAYS TO SUNDAYS INVOLVED ALCOHOL.

11% OF ALL ALCOHOL RELATED COLLISIONS OCCURRED BETWEEN 1:00 A.M. AND 2:00 A.M. ON SATURDAYS AND SUNDAYS.

10.5% OF ALL COLLISIONS INVOLVED ONE OR MORE DRIVERS WHO HAD BEEN DRINKING.

Exhibit 3-5

DRIVER ACTION VS DRIVER CONDITION

	Normal	Had Been Drinking	Impaired-Alcohol	Impaired-Drugs	Fatigue
Driving Properly	5,775	77	2	-	-
Following Too Close	882	29	15	-	1
Speed Too Fast	103	40	18	2	-
Improper Turn	643	22	11	-	-
Disobey Traffic Signal	246	10	9	1	-
Disobey Stop Sign	173	10	8	-	-
Fail to Yield Right-of-Way	1,262	41	19	-	1
Improper Passing	91	5	5	-	-
Lost Control	534	134	80	3	7
Wrong Way on One-Way Street	10	3	1	-	-
Not Known	401	52	27	2	-
Other	683	78	74	5	4
Disobey Other Control	43	4	1	-	-
Totals	10,846	505	270	13	13
% Drivers involved driving properly(a)	59.2	20.5	1.2	-	-

(a) Excluding not known and other.

Medical Defect	Not Known	Other	Totals	(%)	
4	72	1	5,931	(48.7)	Driving Properly
2	35	-	964	(7.9)	Following Too Close
-	16	-	179	(1.5)	Speed Too Fast
3	19	-	698	(5.7)	Improper Turn
-	11	1	278	(2.3)	Disobey Traffic Signal
-	8	-	199	(1.6)	Disobey Stop Sign
-	29	-	1,352	(11.1)	Fail to Yield Right-of-Way
-	6	-	107	(0.9)	Improper Passing
9	65	-	832	(6.8)	Lost Control
-	3	2	19	(0.2)	Wrong Way on One-Way Street
3	184	1	670	(5.5)	Not Known
6	43	-	893	(7.3)	Other
-	3	-	51	(0.4)	Disobey Other Control
27	494	5	12,173	(100.0)	Totals
22.2	-	-	55.9		% Drivers involved driving properly[a]

LESS THAN 15% OF DRIVERS WHO HAD BEEN DRINKING OR WERE IMPAIRED WERE RECORDED AS DRIVING PROPERLY AT THE TIME OF THE COLLISION.

Exhibit 3-6

MOTOR VEHICLE DRIVER AGE VS DRIVER CONDITION

Driver Condition	0 - 4	5 - 9	10- 14	15	16	17	18	19	20	21
Normal	-	1	3	3	131	243	353	371	391	420
Had Been Drinking	-	-	-	-	1	3	23	34	34	40
Impaired - Alcohol	-	-	-	-	-	5	12	7	15	12
Impaired - Drugs	-	-	-	-	-	-	1	-	-	-
Fatigue	-	-	-	-	-	-	1	-	1	1
Medical Defect	-	-	-	-	-	-	1	-	-	1
Not Known	-	-	1	2	8	7	16	23	29	24
Other	-	-	-	-	-	-	-	-	-	-
Totals	-	1	4	5	140	258	407	435	470	498
% Drinking Drivers Involved(a)	-	-	-	-	0.8	3.2	9.0	10.0	11.1	11.0

(a) Excluding not known and other.

22-24	25-34	35-44	45-54	55-64	65-74	75 +	Total	%	Driver Condition
1,155	2,933	1,768	1,312	1,151	487	124	10,846	89.1	Normal
60	162	62	42	33	11	-	505	4.1	Had Been Drinking
36	68	45	36	25	9	-	270	2.2	Impaired-Alcohol
3	2	1	4	2	-	-	13	0.1	Impaired-Drugs
1	2	4	1	2	-	-	13	0.1	Fatigue
2	4	6	3	2	5	5	27	0.2	Medical Defect
67	142	81	38	35	-	6	494	4.1	Not Known
-	2	1	1	-	-	1	5	0.1	Other
1,322	3,315	1,968	1,437	1,250	527	136	12,173	100.0	Totals
									% Drinking Drivers Involved(a)
7.6	7.3	5.7	5.6	4.7	3.8	-	6.6		

6.6% OF ALL DRIVERS INVOLVED HAD BEEN DRINKING OR WERE IMPAIRED BY ALCOHOL AT THE TIME OF THE COLLISION.

THE 18, 19, 20 AND 21 YEAR OLD AGE GROUPS HAD ABOVE AVERAGE LIKELIHOODS OF BEING UNDER THE INFLUENCE OF ALCOHOL AT THE TIME OF A COLLISION.

URBAN DOCUMENTATION CENTRE
RESEARCH UNIT FOR URBAN STUDIES
McMASTER UNIVERSITY
HAMILTON, ONTARIO

Exhibit 3-7

HIT AND RUN COLLISIONS

HIT AND RUN COLLISIONS	849	
HIT AND RUN DRIVERS (a)	852	
DRIVERS APPREHENDED	361	(42%)

42% OF HIT AND RUN DRIVERS WERE SUBSEQUENTLY APPREHENDED.

Exhibit 3-8

HIT AND RUN COLLISION CLASSIFICATION

COLLISIONS IN WHICH:	FATAL	INJURY	PROPERTY DAMAGE	TOTAL
Driver(s) Apprehended	-	109	234	343
Driver(s) Not Apprehended	-	81	425	506
TOTAL	-	190 (22.4%)	659 (77.6%)	849 (100%)

77.6% OF HIT AND RUN COLLISIONS INVOLVED PROPERTY DAMAGE ONLY.

(a) Three collisions involved two hit and run drivers.

Exhibit 3-9

LICENCE STATUS OF MOTOR VEHICLE DRIVERS VS CLASSIFICATION OF COLLISION

Classification	Non-Licenced No.	(% of Non-Licenced)	Licenced No.	(% of Licenced)
Fatal	2	(1.0)	24	(0.2)
Injury	99	(50.3)	4,686	(39.1)
Property Damage	96	(48.7)	7,266	(60.7)
Total	197	(100.0)	11,976	(100.0)

A HIGHER PROBABILITY OF A FATAL OR INJURY COLLISION IS ASSOCIATED WITH THE INVOLVEMENT OF A NON-LICENCED DRIVER.

Exhibit 3-10

LICENCE STATUS OF MOTOR VEHICLE DRIVERS VS DRIVER CONDITION

Driver Condition	Non-Licenced No.	(% of Non-Licenced)	Licenced No.	(% of Licenced)
Normal	100	(50.8)	10,746	(89.7)
Had Been Drinking	35	(17.8)	470	(3.9)
Impaired - Alcohol	32	(16.2)	238	(1.9)
Impaired - Drugs	-	(-)	13	(0.1)
Fatigue	-	(-)	13	(0.1)
Medical Defect	2	(1.0)	25	(0.2)
Not Known	28	(14.2)	466	(3.9)
Other	-	(-)	5	(0.1)
Total	197	(100.0)	11,976	(100.0)

A HIGHER PROBABILITY OF ALCOHOL USE WAS ASSOCIATED WITH THE INVOLVEMENT OF A NON-LICENCED DRIVER.

AN UNLICENCED DRIVER INVOLVED IN A COLLISION WAS OVER FIVE TIMES AS LIKELY TO HAVE BEEN UNDER THE INFLUENCE OF ALCOHOL OR DRUGS AS A LICENCED DRIVER.

Exhibit 3-11
LICENCE STATUS OF MOTOR VEHICLE DRIVER VS DRIVER ACTION

Driver Action	Non-Licenced No.	(% of Non-Licenced)	Licenced No.	(% of Licenced)
Driving Properly	27	(13.7)	5,904	(49.2)
Following Too Close	10	(5.1)	954	(8.0)
Speed Too Fast	18	(9.1)	161	(1.3)
Improper Turn	13	(6.6)	685	(5.7)
Disobey Traffic Signal	6	(3.1)	272	(2.3)
Disobey Stop Sign	7	(3.6)	192	(1.6)
Fail to Yield R.O.W.	19	(9.6)	1,333	(11.1)
Improper Passing	1	(0.5)	106	(0.9)
Lost Control	45	(22.8)	787	(6.6)
Wrong Way on One Way Street	-	(-)	19	(0.2)
Not Known	17	(8.6)	653	(5.5)
Other	33	(16.8)	860	(7.2)
Disobey Other Control	1	(0.5)	50	(0.4)
Total	197	(100.0)	11,976	(100.0)
% Drivers Driving Properly (a)		(18.4)		(56.4)

19% OF INVOLVED NON-LICENCED DRIVERS WERE DRIVING PROPERLY COMPARED WITH 56% OF LICENCED DRIVERS.

THE MOST FREQUENT RECORDED IMPROPER DRIVING ACTIONS FOR NON-LICENCED DRIVERS WERE "LOST CONTROL" AND "FAIL TO YIELD RIGHT OF WAY".

(a) Excluding "Not Known" and "Other".

Exhibit 3-12

TIME OF DAY VERSUS COLLISIONS FOR TOTAL COLLISIONS, COLLISIONS INVOLVING NON-LICENCED DRIVERS AND COLLISIONS INVOLVING ALCOHOL.

Time of Day	Collisions Involving Non-Licenced Drivers No.	(%)	% of Collisions Involving Alcohol	% of Total Collisions Occurring
12 - 1 a.m.	10	5.0	10.2	3.3
1 - 2 a.m.	14	7.0	16.7	3.7
2 - 3 a.m.	11	5.5	6.7	1.7
3 - 4 a.m.	5	2.5	3.3	1.1
4 - 5 a.m.	4	2.0	2.1	0.6
5 - 6 a.m.	2	1.0	1.2	0.4
6 - 7 a.m.	6	3.0	0.8	2.1
7 - 8 a.m.	3	1.5	0.5	2.8
8 - 9 a.m.	2	1.0	0.1	4.8
9 - 10 a.m.	-	-	0.1	3.0
10 - 11 a.m.	4	2.0	0.3	3.6
11 - 12 noon	9	4.5	0.7	5.0
12 - 1 p.m.	9	4.5	1.2	5.6
1 - 2 p.m.	10	5.0	1.6	5.7
2 - 3 p.m.	8	4.0	2.9	6.7
3 - 4 p.m.	17	8.5	2.5	9.1
4 - 5 p.m.	10	5.0	4.4	9.4
5 - 6 p.m.	10	5.0	5.4	7.3
6 - 7 p.m.	12	6.0	6.0	5.0
7 - 8 p.m.	11	5.5	6.7	5.1
8 - 9 p.m.	9	4.5	5.5	3.8
9 - 10 p.m.	14	7.0	5.9	4.2
10 - 11 p.m.	8	4.0	7.8	3.1
11 - 12 midnight	12	6.0	7.6	2.5
Totals	200	100.0	100.0	100.0

BETWEEN 7 P.M. AND 6 A.M., THERE WAS A HIGHER PROPORTION OF NON-LICENCED DRIVERS INVOLVED IN COLLISIONS.
ALCOHOL INVOLVEMENT IN COLLISIONS FOLLOWED A SIMILAR PATTERN.

Exhibit 3-13

IMPROPER DRIVER ACTIONS VS ENFORCEMENT

Column A	Column B		
Apparent Improper Driver Action	% of Improper Driver Actions In Collisions	% of All Comparable Charges Laid in 1983 by Hamilton-Wentworth Police	Column B / Column A
Follow too close	17.3	2.0	0.1
Speed too fast	3.2	49.7	15.5
Improper turn	12.5	15.5	1.2
Disobey traffic signal	5.0	11.1	2.2
Disobey stop or yield sign	3.6	10.7	3.0
Fail to yield right-of-way	24.3	1.1	0.1
Improper passing	1.9	0.4	0.2
Lost Control	14.9	-	-
Wrong way on one-way street	0.3	2.9	9.7
Disobey other control	0.9	0.1	0.1
Other	16.0	6.4	0.4
	100.0	100.0	

42% OF IMPROPER DRIVER ACTIONS ASSOCIATED WITH COLLISIONS ARE DRIVER ACTIONS WHICH CANNOT BE READILY ENFORCED, SUCH AS FOLLOWING TOO CLOSELY, OR FAILING TO YIELD THE RIGHT OF WAY.

A PREDOMINANT NUMBER OF CHARGES WERE LAID UNDER LAWS WHICH ARE READILY ENFORCED.

Exhibit 3-14

MOTORCYCLE DRIVER AGE VS DRIVER ACTION

Driver Action	0 - 14	15 - 19	20 - 24	25 - 34	35 - 44	45 +	Total	(%)
Driving Properly	-	19	51	26	10	4	110	(56.4)
Following Too Close	-	5	1	1	-	-	7	(3.6)
Speed Too Fast	-	-	1	2	-	-	3	(1.5)
Improper Turn	-	-	2	-	1	-	3	(1.5)
Disobey Traffic Signal	-	-	2	-	-	-	2	(1.0)
Disobey Stop Sign	-	2	1	-	-	1	4	(2.1)
Fail to Yield R.O.W.	-	2	1	1	-	-	4	(2.1)
Improper Passing	-	-	2	1	-	-	3	(1.5)
Lost Control	-	7	14	13	1	1	36	(18.5)
Wrong Way One-Way Street	-	-	-	-	-	-	-	(-)
Not Known	1	4	4	5	-	-	14	(7.2)
Other Disobey	-	-	3	4	1	-	8	(4.1)
Other Control	-	1	-	-	-	-	1	(0.5)
Totals	1	40	82	53	13	6	195	(100.0)
% Involved Motorcycle Drivers Driving Properly[a]	-	55.9	68.0	59.1	83.3	66.7	63.6	
% Involved Drivers Driving Properly for all Vehicle Types[a]	-	39.7	55.2	60.7	61.8	58.8	55.9	

MOTORCYCLE DRIVERS WERE MORE LIKELY TO BE DRIVING PROPERLY THAN MOTOR VEHICLE OPERATORS.

THE MOST FREQUENT IMPROPER MOTORCYCLE DRIVER ACTION WAS "LOST CONTROL".

(a) Excluding "not known" and "other".

Exhibit 3-15

CYCLIST ACTION VS AGE OF CYCLIST

Apparent Cyclist Action	0 - 4	5 - 9	10 - 14	15 - 19	20 - 24
Driving Properly	-	3	13	25	17
Following Too Close	-	-	-	1	-
Speed Too Fast	-	-	-	2	2
Improper Turn	1	1	4	1	1
Disobey Traffic Signal	-	1	2	2	-
Disobey Stop Sign	-	4	5	3	1
Fail to Yield Right-of-Way	-	11	12	1	-
Improper Passing	-	-	-	1	-
Lost Control	-	2	2	2	1
Wrong Way on One-Way Road	-	-	4	1	-
Not Known	-	2	4	4	2
Other	-	5	10	4	1
Disobey Other Control	-	-	1	1	1
Totals	1	29	57	48	26
% Involved Cyclists Driving Properly (a)	-	13.6	30.2	62.5	73.9

(a) Excluding "Not Known" and "Other".

25 - 34	35 - 44	45 - 54	55 +	Totals	(%)	Apparent Cyclist Action
18	4	2	1	83	(41.1)	Driving Properly
-	-	-	-	1	(0.5)	Following Too Close
-	-	-	-	4	(1.9)	Speed Too Fast
1	-	-	-	9	(4.5)	Improper Turn
2	-	-	1	8	(3.9)	Disobey Traffic Signal
-	-	-	-	13	(7.6)	Disobey Stop Sign
2	1	-	1	28	(13.9)	Fail to Yield Right-of-Way
-	-	-	-	1	(0.5)	Improper Passing
1	-	-	-	8	(3.9)	Lost Control
1	-	1	-	7	(3.5)	Wrong Way on One-Way Road
2	-	-	1	15	(7.4)	Not Known
1	-	1	-	22	(10.9)	Other
-	-	-	-	3	(1.5)	Disobey Other Control
28	5	4	4	202	(100.0)	Totals
72.0	80.0	66.7	33.3	50.3		% Involved Cyclists Driving Properly

CYCLISTS UNDER 15 WERE MOST LIKELY TO BE DRIVING IN A MANNER THAT VIOLATED BASIC RULES OF THE ROAD.

Chapter Four
Pedestrians

General

In 1983, there were 392 pedestrian collisions resulting in 387 pedestrian injuries, and 5 fatalities. For 3 collisions, full information was not available, so this chapter bases statistics on 389 collisions.

Age

The relationship between the Regional population distribution and pedestrian involvement in collisions in 1983 was reviewed (Exhibit 4-1). It was determined that 5 to 9 year old pedestrians had a rate of collision involvement approximately 2 3/4 times that expected when compared on the basis of the age distribution of the Regional population.

The variations in rate might be explained by certain pedestrian age groups crossing streets more frequently than others (i.e. exposure). It is, however, unlikely that the 5 to 9 year old group would have different exposure to traffic than the 10 to 14 year old group, and, therefore, the 5 to 9 year old pedestrian would appear to be considerably more prone to collision involvement.

Pedestrian Action

Exhibit 4-2 indicates the pedestrian action at the time of the collision versus pedestrian age. In general, the instances of unsafe pedestrian action for pedestrians involved in collisions were greater for pedestrians under 10 years of age.

This exhibit also indicates that the actions of "coming from behind a parked car" or "unexpectedly running into the roadway" accounted for 30 percent of the pedestrian actions at the time of the collisions. These unsafe actions are particularly associated with pedestrians under 10 years of age.

Pedestrians under 14 years of age were more likely to be involved in collisions as a result of not crossing with the right of way at traffic signals (Exhibit 4-3).

Time of Collision

An analysis was performed on the time of day of collisions compared to pedestrian age (Exhibit 4-4) and it was determined that 35 percent of pedestrians were injured in collisions which occurred between 3 p.m. and 6 p.m. Fifty-seven children between 5 and 14 years of age were involved in pedestrian collisions which occurred at school crossing times.* This represents 15 percent of the 389 pedestrians involved in collisions in 1983 or 41 percent of all involved 5 - 14 year olds. Of the 55 school age children involved, ten were crossing at traffic signals.

* School crossing times: 8:00 a.m. - 9:15 a.m., 11:30 a.m. - 1:45 p.m., 3:30 p.m. - 4:45 p.m., Monday - Friday; excluding June, July and August.

Pedestrian Condition

In most cases, the condition of the pedestrian involved in the collision was reported as normal. However, in approximately 10 percent of the collisions involving pedestrians, the pedestrian condition was recorded as "had been drinking" or "impaired" (Exhibit 4-5).

Locations

Exhibit 4-6 indicates the pedestrian age for pedestrians involved in collisions compared with the type of traffic control. In 51 percent of the pedestrian collisions, the collision occurred at a mid-block or other location with no control. For pedestrians under 10 years of age, 69 percent were involved at mid-block or other locations with no control. This is to be expected, as the majority of collisions that involved a young pedestrian resulted from the pedestrian entering the roadway unexpectedly.

Driver Action

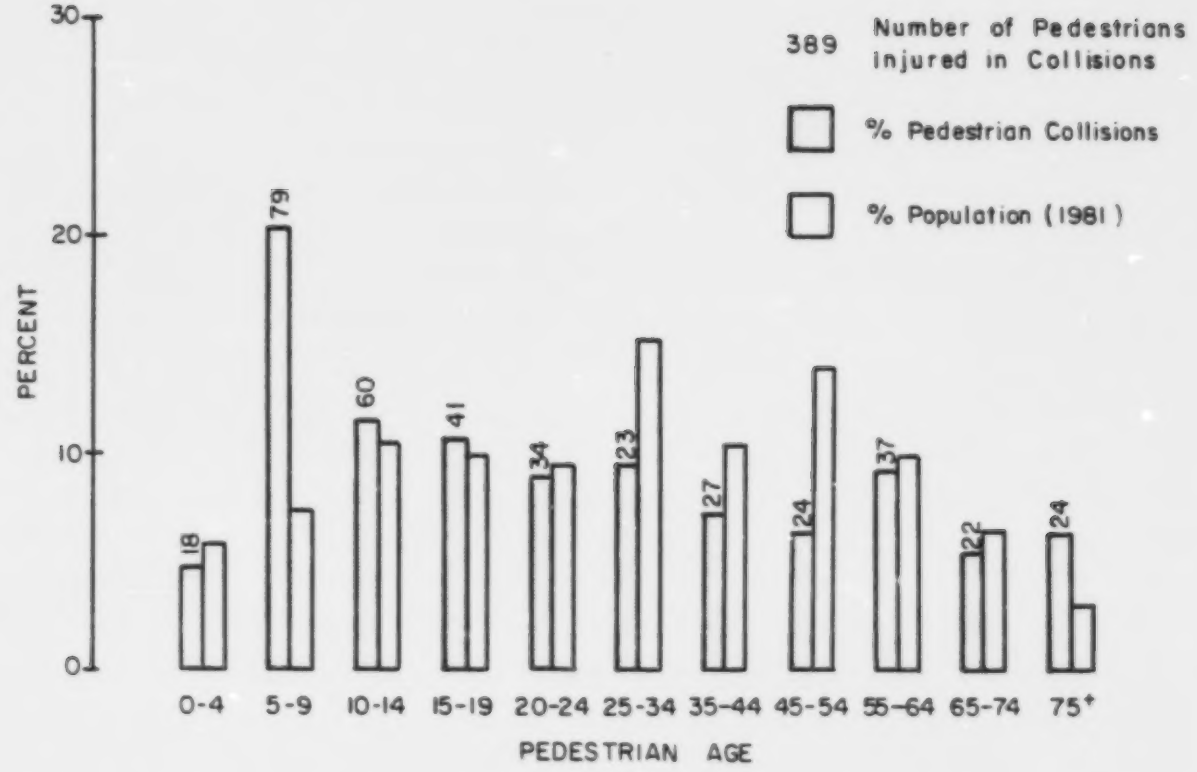
Exhibit 4-7 indicates that in approximately 66 percent of the motor vehicle-pedestrian collisions, the driver was recorded as driving properly. This figure does not necessarily suggest that the drivers involved in these collisions were totally without blame but does indicate that a majority of pedestrian collisions are asscciated with improper pedestrian action or lack of awareness of traffic conditions at the time of the collision.

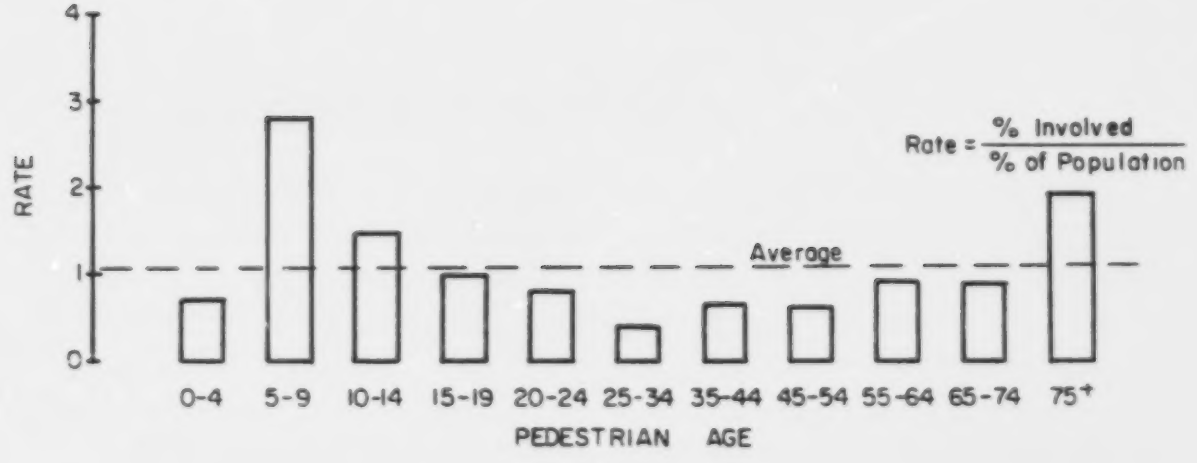
Of the 34 percent of motor vehicle-pedestrian collisions in which the driver was not driving properly, the most frequently recorded driver action was failing to yield the right-of-way (associated with 12 percent of all motor vehicle-pedestrian collisions).

Pedestrian Injuries

Most pedestrians (approximately 80%) suffered only minor injuries when involved in a collision. Exhibit 4-8 indicates that pedestrians under 5 or over 54 years of age were more likely to suffer serious injury. This figure may be as a result of crossing behaviour or may simply reflect the average persons' ability to recover from injury or partially avoid the collision.

PEDESTRIAN AGE VS POPULATION





5 TO 9 YEAR OLD PEDESTRIANS WERE INVOLVED IN COLLISIONS AT A RATE ALMOST THREE TIMES THE AVERAGE.

Exhibit 4-2

PEDESTRIAN AGE VS ACTION

Pedestrian Action	0 - 4	5 - 9	10 - 14	15 - 19	20 - 24	25 - 34
Crossing intersection with right-of-way	1	1	7	12	6	6
Crossing intersection without right-of-way *	1	7	11	4	9	2
Crossing intersection - no control	-	2	2	-	2	1
Walk with traffic *	-	-	-	2	1	1
Walk against traffic	-	-	1	-	2	-
On sidewalk or shoulder	-	2	4	3	2	2
Play/work on highway *	-	1	1	-	3	2
Come from behind parked car *	11	14	3	-	-	1
Run into roadway *	4	46	20	10	1	3
Cross through traffic *	1	6	9	4	3	1
Other	-	-	2	6	5	4
Totals	18	79	60	41	34	23
% Involved Pedestrians with Unsafe Action (Excluding "other")	94.4	93.7	75.9	57.1	58.6	52.6

* Actions considered unsafe

35 - 44	45 - 54	55 - 64	65 - 74	75 +	Total	(%)	Pedestrian Action
12	12	10	7	9	83	(21.3)	Crossing intersection with right-of-way
1	1	5	-	1	42	(10.8)	Crossing intersection without right-of-way *
-	-	3	3	2	15	(3.9)	Crossing intersection - no control
-	-	-	-	1	5	(1.3)	Walk with traffic *
1	-	1	-	-	5	(1.3)	Walk against traffic
4	1	3	2	1	24	(6.2)	On sidewalk or shoulder
2	1	-	-	-	10	(2.6)	Play/work on highway *
1	1	-	1	-	32	(8.2)	Come from behind parked car *
-	1	1	-	2	86	(22.1)	Run into roadway *
6	7	9	6	6	58	(14.9)	Cross through traffic *
-	-	5	3	4	29	(7.5)	Other
27	24	37	22	24	389	(100.0)	Totals
37.0	45.8	46.9	36.8	40.0	64.7		% Involved Pedestrians with Unsafe Action (Excluding "other")

THE INSTANCES OF UNSAFE PEDESTRIAN ACTIONS WERE HIGHEST FOR AGE GROUPS UNDER 10.

30% OF PEDESTRIANS INVOLVED IN COLLISIONS ENTERED THE ROADWAY UNEXPECTEDLY (CAME FROM BEHIND PARKED CARS OR RAN INTO THE ROADWAY).

Exhibit 4-3

PEDESTRIAN AGE VS ACTION AT TRAFFIC SIGNALS

Pedestrian Action	0 - 4 Years	5 - 9 Years	10 - 14 Years	15 - 19 Years	20 - 24 Years	25 - 34 Years
Crossing Intersection with Right-of-Way	1	-	4	6	3	3
Crossing Intersection without Right-of-Way *	-	7	9	3	8	2
Crossing Intersection-No Traffic Control	-	-	-	-	1	-
Walking on Roadway With Traffic *	-	-	-	-	-	1
Walking on Roadway Against Traffic	-	-	-	-	1	-
On Sidewalk or Shoulder	-	1	3	-	-	-
Playing or Working on Highway *	-	-	-	-	1	1
Run Into Roadway *	-	6	5	3	-	1
Cross Through Traffic *	-	-	-	-	-	-
Other	-	-	-	-	-	1
Total	1	14	21	12	14	9
% Pedestrians Crossing or Walking with Right-of-Way (a)	100.0	0.0	19.0	50.0	21.4	37.5

NOTES: (a) Not including "Other"
* Actions considered unsafe

35 - 44 Years	45 - 54 Years	55 - 64 Years	65 - 74 Years	75 + Years	Row Total	%	Pedestrian Action
6	9	8	5	5	50	(42.7)	Crossing Intersection with Right-of-Way
-	-	2	-	1	32	(27.4)	Crossing Intersection without Right-of-Way *
-	-	-	-	-	1	(0.9)	Crossing Intersection-No Traffic Control
-	-	-	-	-	1	(0.9)	Walking on Roadway With Traffic *
-	-	-	-	-	1	(0.9)	Walking on Roadway Against Traffic
1	-	1	-	-	6	(5.1)	On Sidewalk or Shoulder
-	-	-	-	-	2	(1.7)	Playing or Working on Highway *
-	-	-	-	-	15	(12.8)	Run Into Roadway *
1	1	2	1	1	6	(5.1)	Cross Through Traffic *
-	-	1	-	1	3	(2.6)	Other
8	10	14	6	8	117	(100.0)	Total
75.0	90.0	61.5	83.3	71.4	43.9		% Pedestrians Crossing or Walking with Right-of-Way (a)

PEDESTRIANS UNDER THE AGE OF 20 WERE MUCH MORE LIKELY TO BE INVOLVED IN A COLLISION WHILE CROSSING WITHOUT THE RIGHT-OF-WAY.

Exhibit 4-4

TIME OF DAY VS PEDESTRIAN AGE

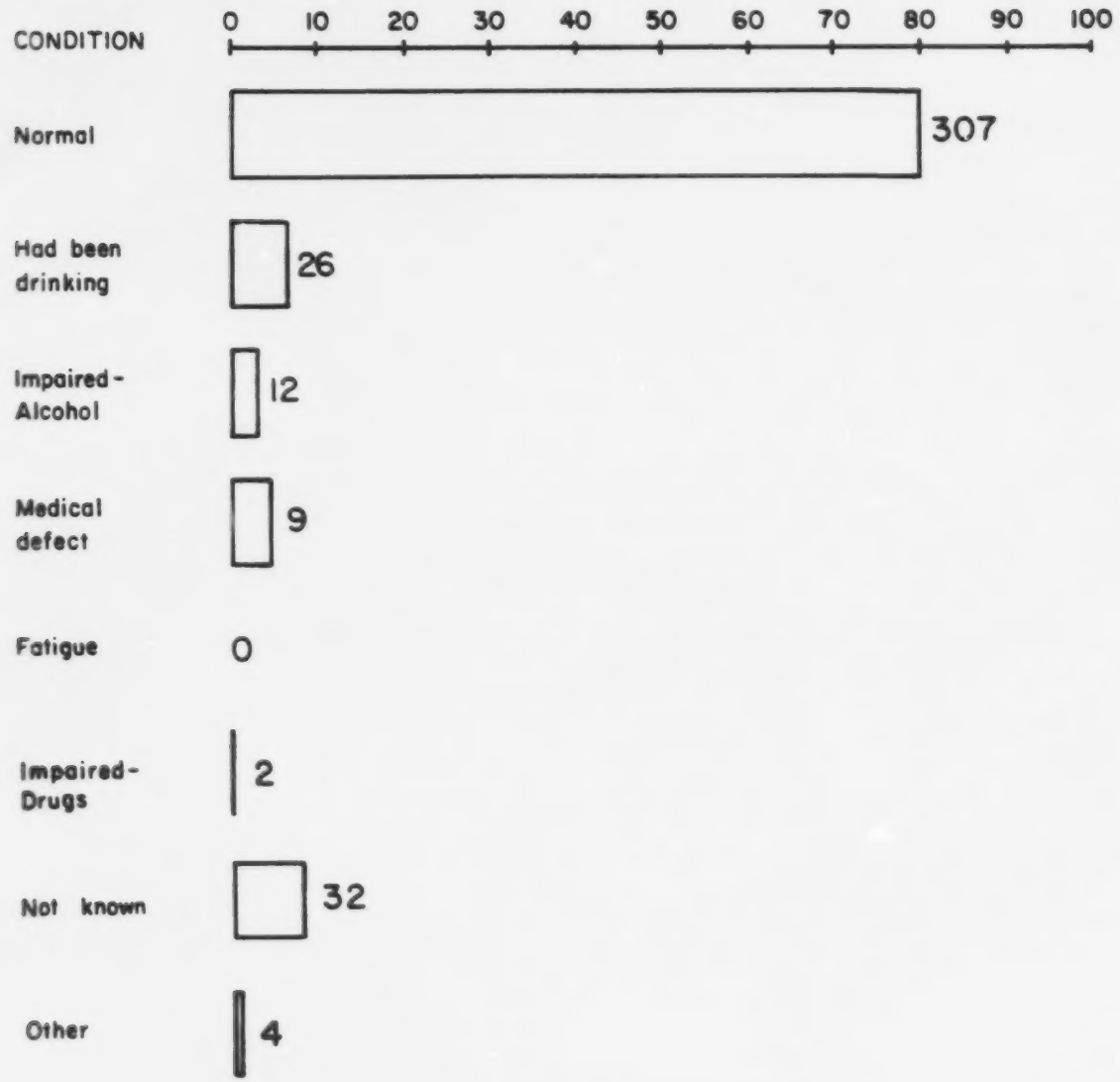
Time of Day	0-4 Yrs	5-9 Yrs	10-14 Yrs	15-19 Yrs	20-24 Yrs	25-34 Yrs	35-44 Yrs	45-54 Yrs	55-64 Yrs	65-74 Yrs	75 + Yrs	Row Total
12 - 1 a.m.	-	-	1	1	3	1	1	1	-	-	-	8
1 - 2 a.m.	-	-	-	-	2	1	-	-	2	-	-	5
2 - 3 a.m.	-	-	-	-	1	2	-	-	-	-	-	3
3 - 4 a.m.	-	-	-	-	1	-	-	-	-	-	-	1
4 - 5 a.m.	-	-	-	-	-	-	-	-	-	-	-	-
5 - 6 a.m.	-	-	1	-	-	-	-	-	-	-	-	1
6 - 7 a.m.	-	-	-	1	-	-	-	1	2	-	-	4
7 - 8 a.m.	-	1	2	2	-	-	1	-	-	-	1	7
8 - 9 a.m.	-	4	6	2	2	3	3	2	2	-	-	24
9 - 10 a.m.	-	-	-	-	-	-	-	-	-	1	1	2
10 - 11 a.m.	-	4	-	-	2	-	2	1	1	1	3	14
11 - 12 noon	-	7	-	1	2	-	-	-	5	3	3	21
12 - 1 p.m.	2	9	4	3	-	1	2	-	-	2	4	27
1 - 2 p.m.	3	4	4	1	-	-	-	2	6	-	1	21
2 - 3 p.m.	-	2	4	1	2	1	-	1	3	-	2	16
3 - 4 p.m.	1	16	10	7	2	1	1	1	4	3	3	49
4 - 5 p.m.	4	17	14	3	3	1	3	3	2	2	2	54
5 - 6 p.m.	2	7	4	4	3	1	3	2	2	4	-	32
6 - 7 p.m.	5	-	3	3	1	3	1	4	2	1	2	25
7 - 8 p.m.	1	7	2	6	2	1	1	-	3	2	1	26
8 - 9 p.m.	-	1	-	-	3	1	1	-	1	-	1	8
9 - 10 p.m.	-	-	4	2	3	3	5	1	-	2	-	20
10 - 11 p.m.	-	-	-	1	1	-	2	3	2	1	-	10
11 - 12 a.m.	-	-	1	3	1	3	1	2	-	-	-	11
Total	18	79	60	41	34	23	27	24	37	22	24	389

35% OF PEDESTRIANS WERE INJURED IN COLLISIONS WHICH OCCURRED BETWEEN 3 P.M. AND 6 P.M.

Exhibit 4-5

PEDESTRIAN CONDITION

PERCENT OF PEDESTRIANS INVOLVED IN COLLISIONS



9.8 PERCENT OF THE PEDESTRIANS INVOLVED IN COLLISIONS WERE IMPAIRED BY OR HAD BEEN DRINKING ALCOHOL.

Exhibit 4-6

PEDESTRIAN AGE VS TYPE OF TRAFFIC CONTROL

Type of Control	0 - 4	5 - 9	10 - 14	15 - 19	20 - 24	25 - 34	35 - 44
Traffic Signal	1	14	21	12	14	9	8
Stop Sign	1	13	7	7	5	5	5
Yield Sign	-	-	-	-	-	-	-
School Guard	-	1	-	-	-	-	-
School Bus	-	-	-	1	-	-	-
No Control	16	51	31	21	15	9	14
Other	-	-	1	-	-	-	-
Totals	18	79	60	41	34	23	27
% Pedestrians Involved in Collisions at Midblock or Other Locations With No Control	88.9	64.6	51.7	51.2	44.1	39.1	51.9

45 - 54	55 - 64	65 - 74	75 +	Totals	(%)	Type of Control
10	14	6	8	117	(30.1)	Traffic Signal
6	9	7	4	69	(17.7)	Stop Sign
-	-	-	-	-	(-)	Yield Sign
-	1	-	-	2	(0.5)	School Guard
-	-	-	-	1	(0.3)	School Bus
8	13	9	12	199	(51.2)	No Control
-	-	-	-	1	(0.3)	Other
24	37	22	24	389	(100.0)	Totals
33.3	35.1	40.9	50.0	51.2		% Pedestrians Involved in Collisions at Mid-Block or Other Locations With No Control

51% OF PEDESTRIAN COLLISIONS OCCURRED AT MID-BLOCK OR OTHER LOCATIONS WITH NO CONTROL.

FOR PEDESTRIANS UNDER 10 YEARS OF AGE 69% WERE INVOLVED AT MID-BLOCK OR OTHER LOCATIONS WITH NO CONTROL.

Exhibit 4-7

DRIVER ACTION IN PEDESTRIAN COLLISIONS

Action	In Pedestrian Collisions	% Pedestrian Collisions
Driving Properly	260	65.9
Following Too Closely	2	0.5
Speed Too Fast	3	0.8
Improper Turn	1	0.3
Disobey Traffic Signal	4	1.0
Disobey Stop Sign	6	1.5
Fail to Yield Right-of-Way	46	11.7
Improper Passing	-	0.3
Wrong Way One-Way Street	-	-
Lost Control	5	1.3
Not Known	37	9.4
Other	27	6.9
Disobey Other Control	3	0.8
	394 (a)	100.0

66% OF THE MOTOR VEHICLE DRIVERS INVOLVED IN PEDESTRIAN COLLISIONS WERE RECORDED AS DRIVING PROPERLY.

THE MOST FREQUENTLY RECORDED IMPROPER DRIVER ACTION WAS FAILURE TO YIELD THE RIGHT-OF-WAY.

(a) Note - Pedestrian collisions involved more than one driver or vehicle in some cases. Data not available on driver action in several collisions.

Exhibit 4-8

PEDESTRIAN AGE VERSUS INJURY STATUS

Pedestrian Age	Status of Inury				Total	% Major or Fatal Injury
	Minimal	Minor	Major	Fatal		
0 - 4	4	9	5	-	18	27.7
5 - 9	27	37	13	2	79	18.9
10 - 14	19	30	11	-	60	18.3
15 - 19	16	18	7	-	41	17.1
20 - 24	8	19	7	-	34	20.6
25 - 34	10	10	3	-	23	13.0
35 - 44	12	10	5	-	27	18.5
45 - 54	6	12	6	-	24	25.0
55 - 64	15	20	2	-	37	5.4
65 - 74	5	13	4	-	22	18.2
75 & Over	4	2	5	3	24	33.3
TOTAL	126	190	68	5	389	18.8
%	32.4	48.8	17.5	1.3	100.0	

EIGHTY-ONE PERCENT OF PEDESTRIANS INVOLVED IN COLLISIONS SUFFERED ONLY MINIMAL OR MINOR INJURIES.

PEDESTRIANS UNDER 5 YEARS OF AGE OR OVER 54 YEARS OF AGE WERE MOST LIKELY TO SUFFER SERIOUS INJURY IN A COLLISION.

Chapter Five
Vehicles

Vehicle Type

For drivers involved in collisions, the percentage of drivers driving properly was higher than average for drivers of conventional buses (Exhibit 5-1). Caution should be exercised when interpreting this exhibit as there is no indication of vehicle exposure.

Vehicle Defects

Vehicle defects were recorded for 156 or approximately 1 percent of the vehicles involved in 1983 collisions (Exhibit 5-2). The most frequently recorded defect was a poor or ineffective vehicle braking system. Although a vehicle defect was recorded, it does not necessarily follow that the defect was the proximate cause of the collision.

Exhibit 5-1

DRIVER ACTION VS VEHICLE TYPE

Driver Action	Non-motor Vehicle	Passenger Car	Car and Trailer	Truck	Truck and Semi	Truck and Trailer
Driving Properly	83	4,992	7	678	58	9
Follow Too Close	2	805	2	148	10	-
Speed Too Fast	4	160	-	29	1	-
Improper Turn	11	583	1	99	15	4
Disobey Traffic Signal	9	243	-	41	2	-
Disobey Stop Sign	13	183	-	22	-	-
Fail to Yield R.O.W.	28	1,179	1	168	8	-
Improper Passing	1	77	-	26	1	-
Lost Control	8	747	-	96	2	1
Wrong Way on One-Way	7	16	-	3	-	-
Not Known	15	854	2	126	8	1
Other	22	732	1	159	28	-
Disobey Other Control	3	39	-	6	3	1
Totals	206	10,610	14	1,601	136	16
% Involved Drivers Driving Properly (a)	49.1	55.3	63.6	51.5	58.0	60.0

FOR DRIVERS INVOLVED IN COLLISIONS, THE PERCENTAGE OF DRIVERS DRIVING PROPERLY WAS HIGHEST FOR DRIVERS OF CONVENTIONAL-TYPE BUSES.

(a) Excluding "not known" and "other".

Motor-Cycle	Bus	School Bus	Other	Totals	(%)	Driver Action
111	110	7	1	6,056	(46.8)	Driving Properly
7	5	-	-	979	(7.6)	Follow Too Close
3	-	-	-	197	(1.5)	Speed Too Fast
3	5	3	-	724	(5.6)	Improper Turn
2	-	-	-	297	(2.3)	Disobey Traffic Signal
4	-	-	-	222	(1.7)	Disobey Stop Sign
4	5	5	-	1,398	(10.8)	Fail to Yield R.O.W.
3	1	-	-	109	(0.8)	Improper Passing
38	-	-	-	892	(6.9)	Lost Control
-	-	-	-	26	(0.2)	Wrong Way on One-Way
15	12	2	-	1,035	(8.0)	Not Known
10	3	-	-	955	(7.4)	Other
1	1	-	-	54	(0.4)	Disobey Other Control
201	142	17	1	12,944	(100.0)	Totals
63.1	86.6	46.7	100.0	55.3		% Involved Drivers Driving Properly (a)

Exhibit 5-2

VEHICLE DEFECTS

Defect Type	Non Motor Vehicle	Passenger Cars	Car and Trailer	Truck	Truck and Trailer	Truck and Semi	Motor-Cycle	Bus	School Bus	Other	Totals	%
Brakes	6	25	-	10	-	1	1	-	-	-	43	27.6
Steering	-	4	-	1	-	-	-	-	-	-	5	3.2
Tire Puncture or Blowout	-	12	-	2	-	-	-	-	-	-	14	8.9
Tire Tread Insufficient	-	7	-	4	-	-	-	-	-	-	11	7.1
Headlamps Defective	4	2	-	2	-	-	-	-	-	-	8	5.1
Other Lamps or Reflectors Defective	3	3	-	1	-	3	-	-	-	-	7	4.5
Engine Control Defective	-	8	-	1	-	-	-	-	-	-	9	5.8
Wheels or Suspension Defective	-	2	-	1	-	-	-	-	-	-	3	1.9
Vision Obsured	-	3	-	-	-	-	-	-	-	1	4	2.6
Trailer Hitch Defective	-	3	1	-	-	-	-	-	-	-	4	2.6
Other	2	31	-	10	-	2	3	-	-	-	48	30.7
Totals	12	100	1	32	-	6	4	-	-	1	156	100.0
Defective Vehicles as a % of all vehicles of the same type involved in collisions (a)	5.8	0.9	7.1	2.0	-	4.4	2.0	-	-	100.0	1.2%	

DEFECTIVE BRAKES ACCOUNTED FOR 27.6% OF THE RECORDED DEFECTS.

(a) Does not include parked vehicles.

Chapter Six
Environment

Light Conditions

Exhibit 6-1 indicates that most collisions occurred under clear visibility conditions. Although poor light conditions can make driving difficult, collisions under these conditions are probably associated with drivers failing to adjust properly to changed conditions, particularly those associated with the roadway surface. Exhibit 6-2 indicates that 64 percent of the collisions occurred under daylight conditions.

Road Surface

An estimated 61 percent of collisions occurred under dry pavement conditions (Exhibit 6-3).

Pavement Markings

In accordance with Exhibit 6-4, an estimated 78 percent of collisions occurred on marked roadways where the markings were visible. In over 88 percent of the cases where the road markings were recorded as not visible or obscured, snow, slush, or ice conditions were also reported. It is important to note that pavement markings that are not visible to the driver are not necessarily associated with collision cause. Further analysis would be necessary to indicate whether or not there was a causal relationship.

Road Character

Exhibits 6-5 and 6-7 show that of collisions occurring at intersections, 65 percent occurred at the intersection of two, two-way undivided roads and 86 percent occurred at the intersection of two roadways with straight and level alignment.

Exhibits 6-6 and 6-8 show that, for collisions occurring at locations other than intersections, 78 percent occurred on two-way undivided roadways and 71 percent occurred on straight and level alignment.

As normalizing data such as the percentages, various categories of intersections and the traffic volumes passing through those intersections is not presently available, it is not possible to state that one intersection type is less prone to collision occurrence than another. However, the reader is referred to Exhibit 7-4 in regard to signalized intersections and Exhibit 7-7 in regard to arterial roadway sections.

Road Location and Traffic Control

Exhibit 6-9 indicates that the greatest number of collisions occurred at non-intersection locations. If the intersection-related and in-intersection categories are combined, there were a greater number of collisions directly or indirectly related to intersections. As the exposure to vehicle conflicts is inherently greater at intersection locations, this result is not unexpected. Exhibit 6-10 indicates that collisions occurring at signalized intersections have approximately the same chance of resulting in serious injury than do collisions occurring at stop- or yield-controlled intersections, or locations with no control.

Exhibit 6-11 indicates that the measured point of impact of over one-half of all collisions was within 9 metres of the curb lines of an intersection. Twenty-one percent of collisions occurred at signalized intersections, and 11% of collisions occurred at intersections with no formal control.

Road Condition

An estimated 98 percent of roads were in good condition at the time of the collision (Exhibit 6-12). Although some roadways were under construction or under repair in the vicinity of the collision, this does not directly imply that road condition was a contributing cause of the collision.

Fixed Objects

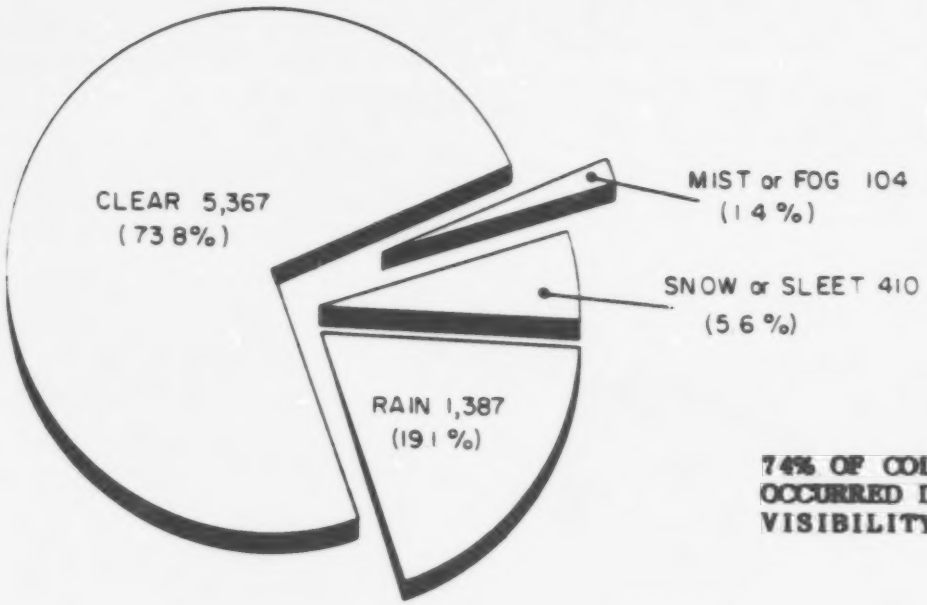
There were 1,222 recorded cases where vehicles struck fixed objects by the roadside (Exhibits 6-13 and 6-14). Twenty-eight percent of the fixed objects struck by vehicles were rigid poles. In 80% of all fixed object collisions, a single motor vehicle left the roadway and struck a roadside object as its primary impact. In the remaining cases (20%), it would appear that the fixed object was struck after impact with another vehicle or pedestrian.

The chances of injury or death occurring were higher in collisions involving two or more vehicles in which a fixed object was struck than in single motor vehicle fixed object collisions. This may reflect the different nature of the types of collisions.

Eight collisions in which a fixed object was struck resulted in fatalities. This frequency is approximately three times the rate of occurrence of fatalities in collisions in which no fixed object was involved.

Exhibit 6-1

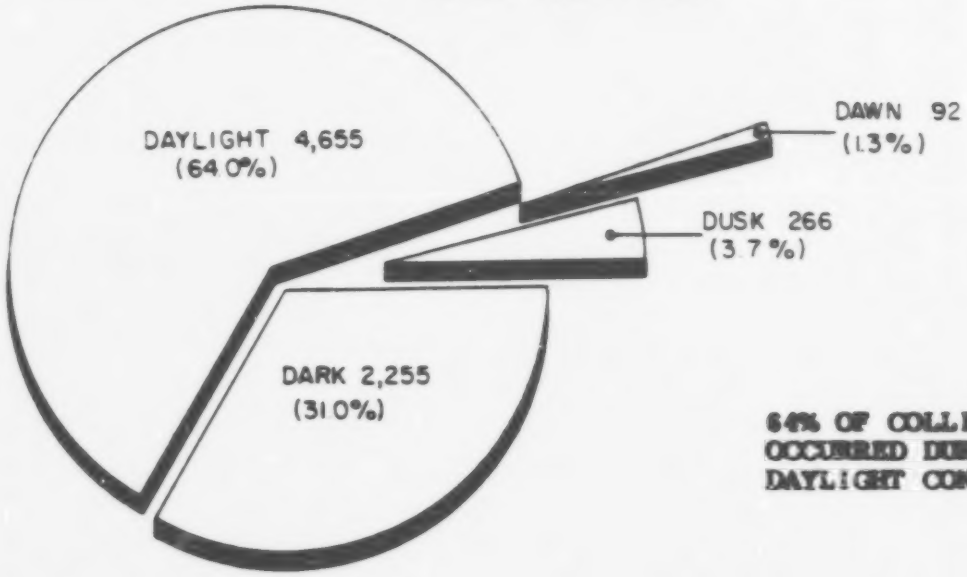
VISIBILITY CONDITIONS



74% OF COLLISIONS OCCURRED DURING CLEAR VISIBILITY CONDITIONS

Exhibit 6-2

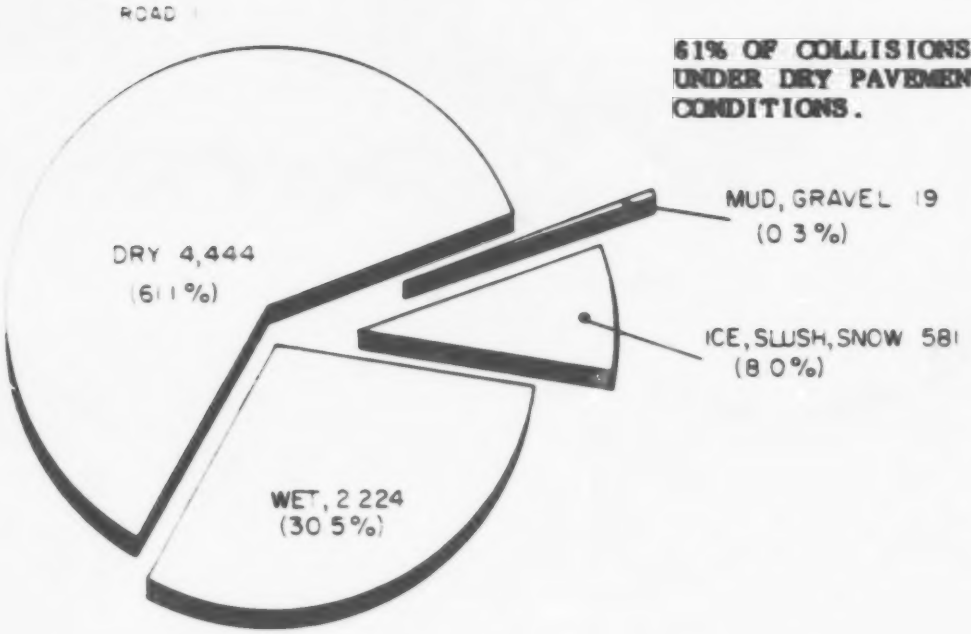
LIGHT CONDITIONS



64% OF COLLISIONS OCCURRED DURING DAYLIGHT CONDITIONS

Exhibit 6-3

ROAD 1 SURFACE CONDITIONS



61% OF COLLISIONS OCCURRED UNDER DRY PAVEMENT CONDITIONS.

Exhibit 6-4

ROAD 1 PAVEMENT MARKINGS VERSUS ROAD SURFACE CONDITIONS

SURFACE	MARKINGS: GOOD	FAIR	NOT VISIBLE OBSCURED	NONE
DRY	3604 49 6%	78 1 1 %	38 0 5%	724 10.0%
WET	1886 25 9%	49 0 7%	36 0 5 %	253 3 5%
SNOW SLUSH ICE	167 2 3%	12 0 2%	284 3 9%	118 1 6%
MUD GRAVEL	4 0 1%	0 0 0%	2 0 1%	13 0 2%

86% OF COLLISIONS OCCURRED ON MARKED ROADWAYS WHERE THE MARKINGS WERE VISIBLE.

Exhibit 6-5

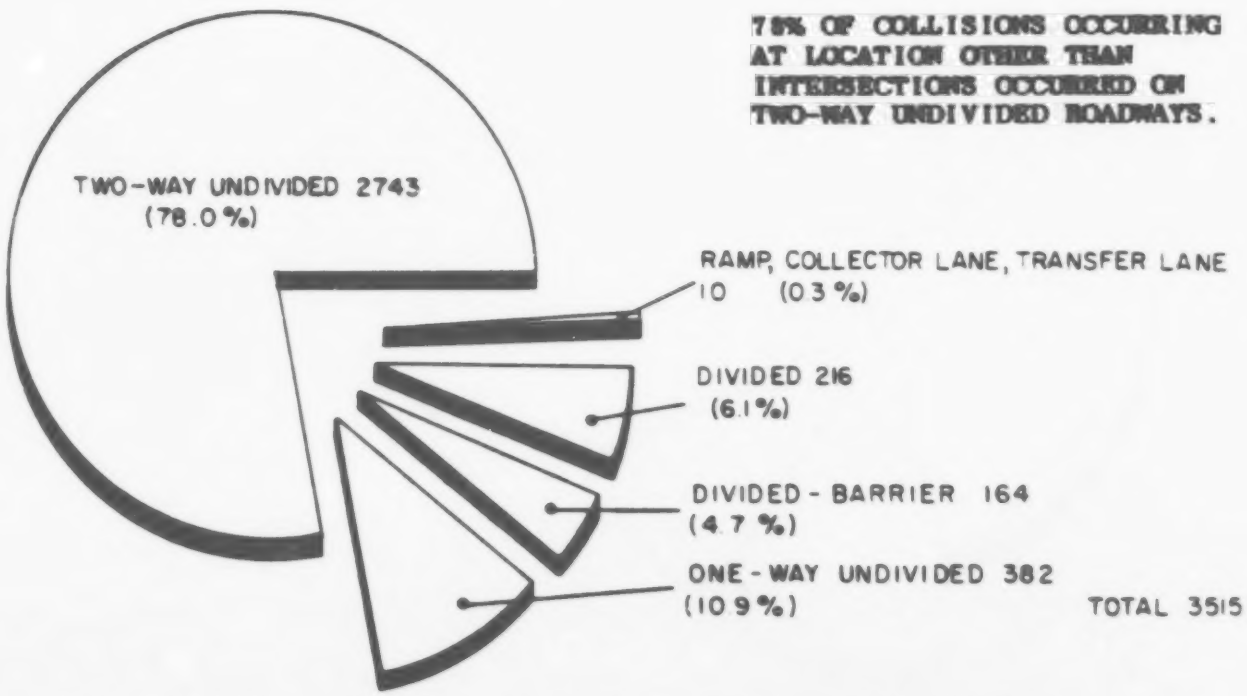
ROAD CHARACTER FOR COLLISIONS OCCURRING AT INTERSECTIONS (a)

ROAD 2 \ ROAD 1	ONE-WAY UNDIVIDED	TWO-WAY UNDIVIDED	DIVIDED BARRIER	DIVIDED	COLLECTOR LANES RAMPS
ONE-WAY UNDIVIDED	611				
TWO-WAY UNDIVIDED	471	2281			
DIVIDED BARRIER	28	64	74		
DIVIDED	44	97	0	72	
COLLECTOR LANES RAMPS	1	4	2	2	2
TOTAL	1155	2446	76	74	3753

61% OF COLLISIONS AT INTERSECTIONS OCCURRED AT THE INTERSECTION OF TWO-WAY UNDIVIDED ROADWAYS.

Exhibit 6-6

ROAD CHARACTER, FOR COLLISIONS NOT OCCURRING AT INTERSECTIONS(b)



78% OF COLLISIONS OCCURRING AT LOCATION OTHER THAN INTERSECTIONS OCCURRED ON TWO-WAY UNDIVIDED ROADWAYS.

(a) COLLISIONS REPORTED AS BEING IN THE INTERSECTION OR INTERSECTION-RELATED. DATA INCOMPLETE IN 69 CASES.

(b) COLLISIONS NOT REPORTED AS BEING IN THE INTERSECTION OR INTERSECTION-RELATED.

Exhibit 6-7

ROAD ALIGNMENT FOR COLLISIONS OCCURRING AT INTERSECTIONS(a)

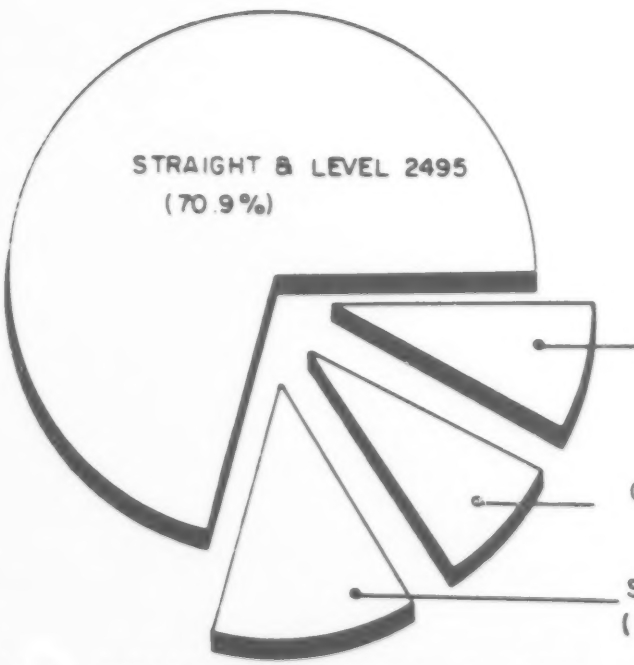
ROAD 1

ROAD 2	STRAIGHT & LEVEL	STRAIGHT ON HILL	CURVE ON LEVEL	CURVE ON HILL	
STRAIGHT & LEVEL	3208				
STRAIGHT ON HILL	216	97			
CURVE ON LEVEL	95	9	43		
CURVE ON HILL	24	20	7	28	
TOTALS	3543	126	50	28	3747

86% OF COLLISIONS OCCURRED AT THE INTERSECTION OF TWO STRAIGHT AND LEVEL ROADWAYS.

Exhibit 6-8

ROAD ALIGNMENT FOR COLLISIONS NOT OCCURRING AT INTERSECTIONS(b)



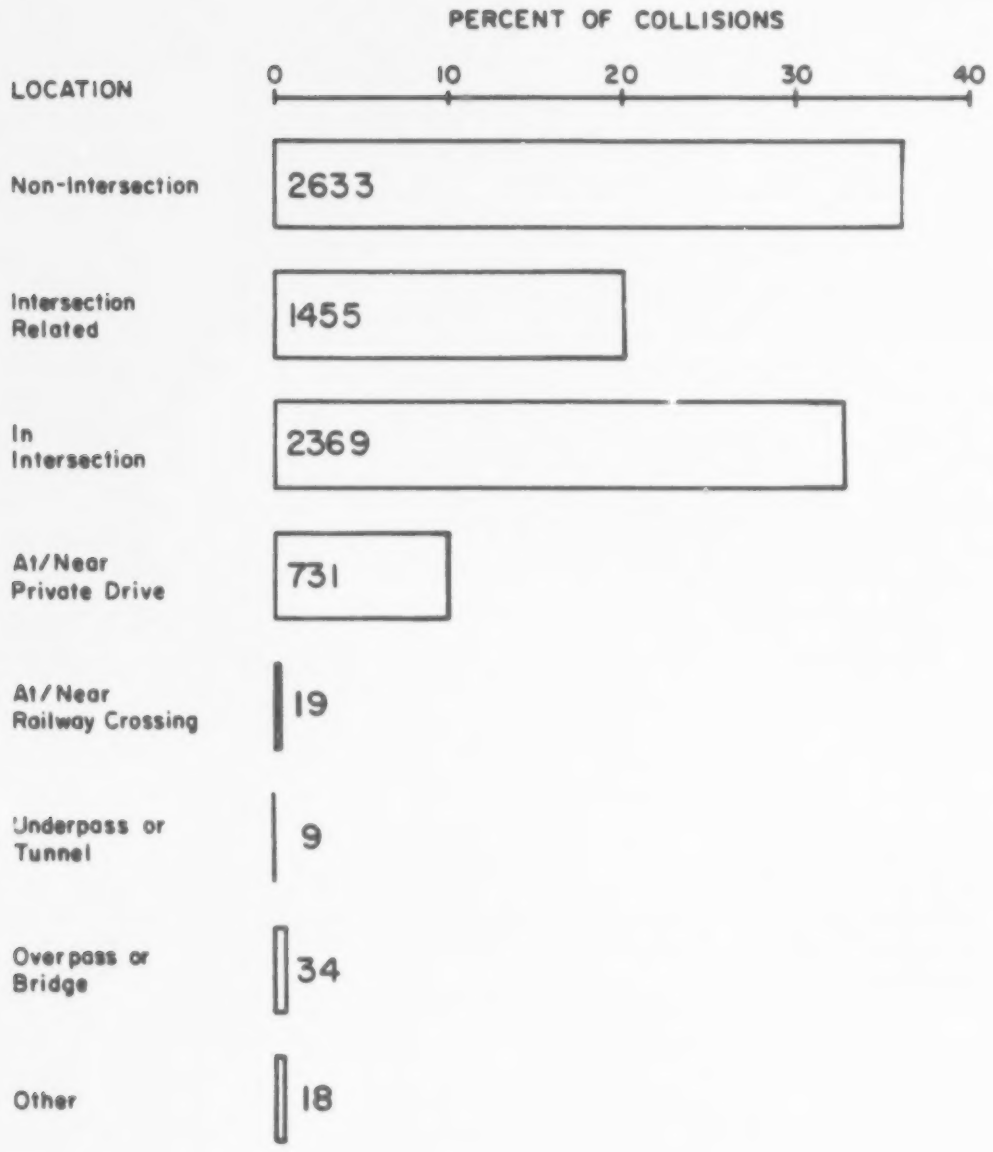
71% OF COLLISIONS OCCURRING AT LOCATIONS OTHER THAN INTERSECTIONS OCCURRED ON ROADWAYS WITH STRAIGHT AND LEVEL ALIGNMENT.

(a) COLLISIONS REPORTED AS BEING IN THE INTERSECTION OR INTERSECTION-RELATED. DATA INCOMPLETE IN 77 CASES.

(b) COLLISIONS NOT REPORTED AS BEING IN THE INTERSECTION OR INTERSECTION-RELATED.

Exhibit 6-9

LOCATION OF COLLISIONS



47% OF COLLISIONS OCCURRED AT NON-INTERSECTION LOCATIONS.

Exhibit 6-10

TRAFFIC CONTROL VS CLASS OF COLLISION

Traffic Control	Fatal Injury	Non-Fatal Injury	Property Damage Only	Totals	(%) Fatal or Injury Collisions
Traffic Signal	2	829	1,151	1,982	(41.9)
Stop Sign	7	589	905	1,501	(39.7)
Yield Sign	-	25	33	58	(43.1)
Police Control	-	-	-	-	(-)
School Guard	-	3	3	6	(50.0)
School Bus	-	4	1	5	(80.0)
No Control	11	1,373	2,293	3,677	(37.6)
Other	-	16	23	39	(41.0)
Totals	20	2,839	4,409	7,268	(39.3)

COLLISIONS OCCURRING AT SIGNALIZED INTERSECTIONS HAVE APPROXIMATELY THE SAME CHANCE OF RESULTING IN INJURY AS DO COLLISIONS OCCURRING AT STOP- OR YIELD-CONTROLLED INTERSECTIONS, OR LOCATIONS WITH NO CONTROL.

Exhibit 6-11

TRAFFIC CONTROL VS ROAD LOCATION

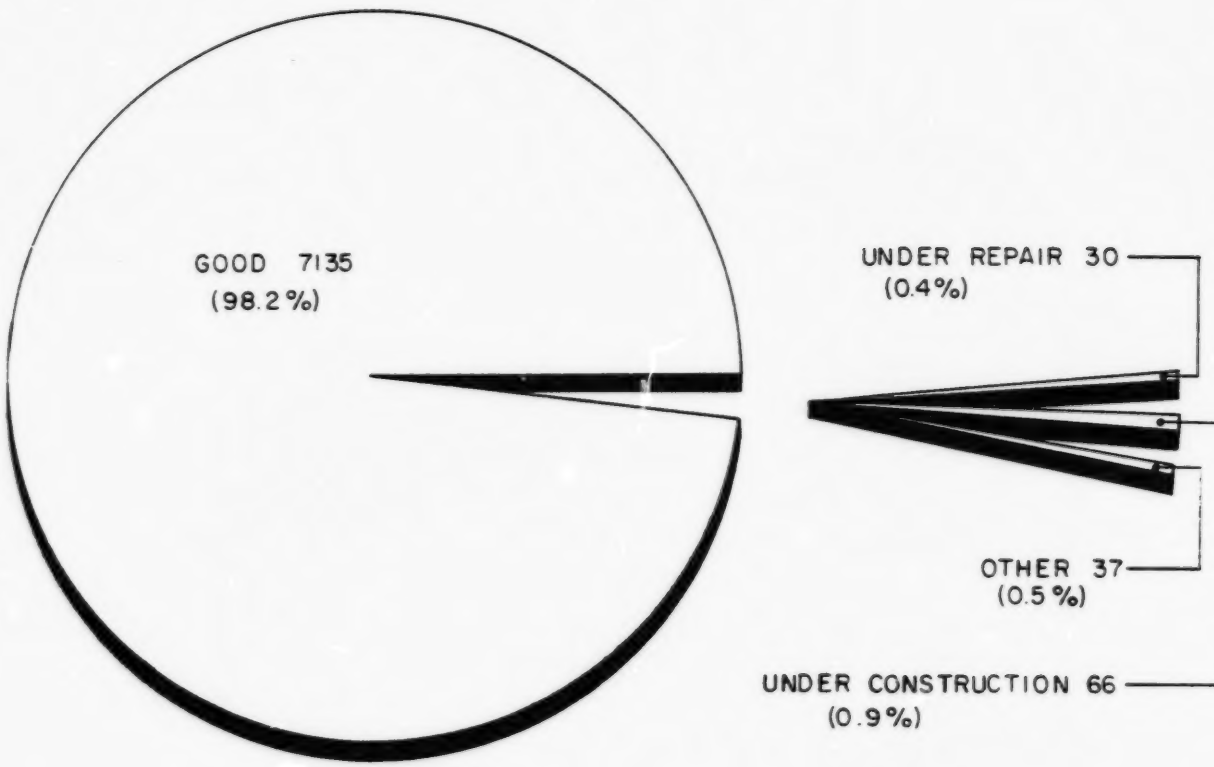
Distance From Intersection	Traffic Signal	Stop Sign	Yield Sign	Police Control	School Guard	School Bus	No Control	Other	Total	%
In Intersection (Within 9 Metres)	1,559	1,264	38	-	5	1	817	14	3,698	50.9
9.1 to 20 Metres	174	102	3	-	-	-	564	2	845	11.6
20.1 to 40 Metres	138	49	3	-	-	1	663	5	859	11.8
40.1 to 60 Metres	45	21	3	-	-	1	384	4	458	6.3
Over 60 Metres	66	65	11	-	1	2	1,249	14	1,408	19.4
	1,982	1,501	58	-	6	5	3,677	39	7,268	100.0

62% OF ALL COLLISIONS OCCURRED WITHIN 20 METRES OF AN INTERSECTION.

21% OF ALL COLLISIONS OCCURRED AT A SIGNALIZED INTERSECTION.

Exhibit 6-12

ROAD CONDITION



98% OF ROADWAYS ON WHICH COLLISIONS OCCURRED WERE IN GOOD CONDITION (I.E. NOT UNDER REPAIR OR UNDER CONSTRUCTION AT THE TIME OF THE COLLISION)

Exhibit 6-13

FIXED OBJECTS STRUCK VERSUS ROAD LOCATION

Object Struck	ROAD LOCATION Non-Intersection	Intesection Related	In Intersection	Private Drive	Railroad Crossing	Underpass or Tunnel	Overpass or Bridge	Other	Total	(%)	% Single Motor Vehicle
Restraining Barrier	63	9	8	-	2	-	3	2	87	(7.1)	87.4
Rigid Pole	192	64	66	14	1	-	-	-	337	(27.6)	78.9
Break-away Pole	49	9	18	3	-	-	-	-	79	(6.5)	83.5
Tree	67	17	7	3	-	-	-	-	94	(7.7)	88.3
Post (Sign; Parking Meter)	30	24	17	1	-	-	2	2	76	(6.2)	71.1
Fence	28	15	4	4	-	-	2	-	53	(4.3)	81.1
Culvert	10	-	1	5	-	-	-	-	16	(1.3)	100.0
Bridge Support	3	4	3	-	-	3	3	-	16	(1.3)	81.3
Rock Face	10	-	1	-	-	-	-	-	11	(0.9)	100.0
Snowbank or Drift	-	-	-	-	-	-	-	-	-	(-)	-
Ditch	100	19	13	7	-	-	1	2	141	(11.5)	91.5
Curb	45	24	22	10	-	-	4	1	106	(8.7)	60.4
Crash Cushion	4	-	-	-	-	-	1	-	5	(0.4)	100.0
Building or Wall	31	19	14	7	-	-	-	2	73	(6.0)	65.8
Other	70	27	11	15	2	1	1	1	128	(10.5)	77.3
Total	702	231	185	69	5	4	16	10	1,222	(100.0)	79.6

28% OF FIXED OBJECTS STRUCK BY ALL VEHICLES WERE RIGID POLES.
80% OF COLLISIONS INVOLVING FIXED OBJECTS WERE SINGLE MOTOR VEHICLE COLLISIONS.

FIXED OBJECT VERSUS CLASS OF COLLISION

Object Struck	Fatal	Personal Injury	Property Damage Only	Total	% Fatal or Injury
Restraining Barrier	-	23	64	87	26.4
Rigid Pole	1	161	175	337	48.1
Breakaway Pole	-	39	40	79	49.4
Tree	1	45	48	94	48.9
Post, Sign, Parking Meter	1	19	56	76	26.3
Fence	1	19	33	53	37.7
Culvert	-	10	6	16	62.5
Bridge Support	-	11	5	16	68.8
Rock Face	-	3	8	11	27.3
Snowbank or Drift	-	-	-	-	-
Ditch	4	68	69	141	51.1
Curb	-	46	60	106	43.4
Crash Cushion	-	2	3	5	40.0
Building or Wall	-	32	41	73	43.8
Other	-	52	76	128	40.6
Total	8	530	684	1,222	44.0
Single Motor Vehicle Collisions	7 (0.7%)	390 (40.1%)	576 (59.2%)	973 (100.0%)	
Collisions Involving Two or More Vehicles	1 (0.4%)	140 (56.2%)	108 (43.4%)	249 (100.0%)	

THE PROBABILITY OF INJURY OR DEATH IS HIGHEST FOR COLLISIONS IN WHICH A BRIDGE SUPPORT OR CULVERT IS HIT.

THE CHANCE OF INJURY OR DEATH IN A COLLISION IN WHICH A FIXED OBJECT IS HIT IS HIGHER WHEN TWO OR MORE VEHICLES ARE INVOLVED.

SEVEN SINGLE MOTOR VEHICLE COLLISIONS IN WHICH FIXED OBJECTS WERE STRUCK RESULTED IN FATALITIES.

Chapter Seven
Locations

General

Locations that have high numbers or rates of collision occurrences have received regular attention by roadway authorities in the Region and countermeasures are constantly being implemented on existing facilities and incorporated into the design of new facilities. However, physical alterations are not effective in preventing the majority of traffic collisions as these are the direct result of driver or pedestrian error.

Area Municipality

In general, the collision rate increased with increasing municipality size (Exhibit 7-1).

High Frequency Intersection Locations

Exhibit 7-2 represents a list of the 67 locations which experienced the highest number of collision occurrences in 1983. All 1983 collisions occurring at traffic signals were subjected to the control chart analysis technique (Exhibit 7-3). Additional information including collision data from previous years is included with this exhibit.

Exhibit 7-4 shows the relative number of collisions and collision rates for selected groups of signalized intersections.

These exhibits do not necessarily represent priority lists for improvements as other factors have to be taken into account such as cost-benefit considerations or the deployment of other countermeasure opportunities which may be more cost-effective.

In many cases, these locations are already under consideration for various forms of improvement on a priority basis.

High Frequency Road Section Locations

Exhibits 7-5, 7-6 and 7-7 portray arterial roadway sections within the City of Hamilton which have the highest collision rates. The criteria for reporting is collisions per million vehicle kilometres travelled per annum. Exhibit 7-5 evaluates roadway sections including all collisions along the roadway. Exhibit 7-6 demonstrates collision rates on roadway sections excluding collisions occurring within 9 metres of a signalized intersection. Exhibit 7-7 shows collision rates on roadway sections excluding collisions occurring at <u>all</u> intersections, signalized or non-signalized. Exhibit 7-8 presents a summary of collision rates for selected groups and subcategories of the arterial system.

The trends over the past seven years are interesting to note when reviewing Exhibit 7-7. As the overall number of collisions within the City of Hamilton and Region has been dropping since 1977, with traffic volumes relatively constant, collision rates on roadway sections show a parallel decline.

Exhibit 7-1

COLLISIONS VS AREA MUNICIPALITY

Municipality	Class of Collision (a) Fatal	Non-Fatal Injury	Property Damage Only	All Collisions	1983 Collision Rate per 1,000 Pop. (b)
Ancaster	2	86	104	192	13.4
Dundas	1	105	210	316	16.2
Flamborough	3	100	158	261	10.8
Glanbrook	2	42	47	91	9.3
City of Hamilton	10	2,262	3,549	5,821	19.0
Stoney Creek	2	244	341	587	16.5
Total for the Regional Municipality of Hamilton-Wentworth	20	2,839	4,409	7,268	17.7

COLLISION RATE IN TERMS OF COLLISIONS PER 1,000 POPULATION GENERALLY INCREASED WITH INCREASED MUNICIPALITY SIZE.

(a) Collisions reported to the Hamilton-Wentworth Regional Police only; areas patrolled by the Provincial Police (e.g. Kings Highways) are not included.

(b) 1980 population figures used.

Exhibit 7-2

INTERSECTIONS WITH HIGHEST NUMBER OF COLLISIONS IN 1983 (a)

	Intersection	Type of Traffic Control	Number of Collisions	5 Yr. Avg.
1.	Main/Dundurn	Traffic Signal	22	18.4
2.	Fennell/Upper Gage	Traffic Signal	21	17.6
3.	King/Centennial	Traffic Signal	21	17.6
4.	Queenston/Nash	Traffic Signal	21	20.2
5.	Barton/Woodward	Traffic Signal	20	17.4
6.	Fennell/Upper Wentworth	Traffic Signal	20	12.4
7.	King/Bay	Traffic Signal	20	13.0
8.	Queenston/Centennial	Traffic Signal	19	23.2
9.	Barton/John	Traffic Signal	18	15.0
10.	Caroline/Charlton	1 Way Stop (2 One-Way Streets)	17	9.4
11.	Aberdeen/Queen	Traffic Signal	16	13.0
12.	Main/John	Traffic Signal	16	20.4
13.	Mohawk/Upper Ottawa	Traffic Signal	16	13.2
14.	Mohawk/Upper Paradise	Traffic Signal	15	14.8
15.	Cannon/James	Traffic Signal	14	9.6
16.	Fennell/Upper Ottawa	Traffic Signal	14	14.0
17.	Fennell/Upper Sherman	Traffic Signal	14	15.0
18.	Main/Victoria	Traffic Signal	14	22.4
19.	Brampton/Parkdale	Traffic Signal	13	13.2
20.	Fennell/Upper Wellington	Traffic Signal	13	10.6
21.	King/Victoria	Traffic Signal	13	14.4
22.	Mohawk/Upper James	Traffic Signal	13	14.4

	Intersection	Type of Traffic Control	Number of Collisions	5 Yr. Avg.
23.	Aberdeen/Dundurn	Traffic Signal	12	11.6
24.	Charlton/Sherman Access	Traffic Signal	12	14.0
25.	Fennell/Garth/Scenic	Traffic Signal	12	10.0
26.	King/Quigley	Traffic Signal	12	6.8
27.	Main/Bay	Traffic Signal	12	12.0
28.	Main/Kenilworth	Traffic Signal	12	12.0
29.	York/Locke	Traffic Signal	12	12.0
30.	Balmoral/Main	2 Way Stop	11	8.0
31.	Barton/Victoria	Traffic Signal	11	10.0
32.	Cannon/Kenilworth	Traffic Signal	11	9.8
33.	Cannon/Wellington	Traffic Signal	11	8.2
34.	King/York	Traffic Signal	11	6.4
35.	Main/Cootes/Leland	Traffic Signal	11	8.6
36.	Main/Wellington	Traffic Signal	11	14.4
37.	Queensdale/Upper Gage	Traffic Signal	11	11.4
38.	Rymal/Upper James	Traffic Signal	11	10.6
39.	Arrowsmith/Centennial	1 Way Stop (Tee Int.)	10	5.4
40.	Britannia/Parkdale	1 Way Stop (Tee Int.)	10	5.8
41.	Charlton/Hughson	2 Way Stop (Opposite Private Driveway)	10	6.6
42.	Barton/Kenilworth	Traffic Signal	10	8.6
43.	Hunter/John	Traffic Signal	10	11.2
44.	Industrial/Ottawa	Traffic Signal	10	9.2
45.	King/Longwood	Traffic Signal	10	5.6
46.	Limeridge/Upper James	Traffic Signal	10	10.0
47.	Main/Locke	Traffic Signal	10	10.6

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	Intersection	Type of Traffic Control	Number of Collisions	5 Yr. Avg.
48.	Queensdale/Upper Sherman	Traffic Signal	10	5.0
49.	York/Dundurn	Traffic Signal	10	14.0
50.	Barton/Elgin	2 Way Stop	9	4.4
51.	Glen Echo/Nash	2 Way Stop (Opposite Private Driveway)	9	3.4
52.	Barton/Gage	Traffic Signal	9	13.8
53.	Barton/Kenora	Traffic Signal	9	7.8
54.	Barton/Nash	Traffic Signal	9	7.6
55.	Barton/Ottawa	Traffic Signal	9	10.4
56.	Charlton/Queen	Traffic Signal	9	10.0
57.	Cootes/Olympic	Traffic Signal	9	9.0
58.	Hunter/Hess	Traffic Signal	9	8.4
59.	King/Dundurn	Traffic Signal	9	14.0
60.	King (North Branch)/James	Traffic Signal	9	11.2
61.	King/Lake	Traffic Signal	9	5.2
62.	King/Wentworth	Traffic Signal	9	6.2
63.	Main/Macklin	Traffic Signal	9	10.6
64.	Main/Sherman	Traffic Signal	9	10.2
65.	Mohawk/Upper Wentworth	Traffic Signal	9	8.8
66.	Queenston/Woodman	Traffic Signal	9	5.4
67.	Wilson/Victoria	Traffic Signal	9	6.4

(a) Only collisions occurring within 31 feet (9.5 m) of the intersection are defined as being "in" the intersection, and are included on this list.

Exhibit 7-3

SIGNALIZED INTERSECTIONS WITH HIGHEST COLLISION RATES IN 1983 *

	Intersection	R_L / R_C	(a) R_L	(b) R_C	Number of Collisions 1982(c) AWDT	1983	1982	1981	1980	5 YR AVG.
1.	Fennell/Wentworth	2.85	2.96	1.04	20,194	20	10	11	9	12.4
2.	Barton/John	2.66	2.78	1.05	18,846	18	9	13	15	15.0
3.	Fennell/Gage	2.45	2.47	1.01	22,954	20	13	18	15	17.6
4.	Hunter/Hess	2.43	2.88	1.19	8,043	9	5	5	12	8.4
5.	Mohawk/Ottawa	2.24	2.32	1.03	20,148	16	8	12	15	13.2
6.	Charlton/Hess	2.00	2.40	1.20	7,089	7	2	4	4	4.6
7.	Charlton/Sherman Access	1.84	1.93	1.05	18,123	12	16	14	20	14.0
8.	King/Centennial	1.84	1.73	0.94	37,824	22	14	17	15	17.6
9.	Fennell/Ottawa	1.83	1.87	1.02	21,286	14	10	15	14	14.0
10.	Queenston/Nash	1.80	1.69	0.94	38,827	21	15	16	26	20.2
11.	Barton/Woodward	1.80	1.71	0.95	34,215	20	18	13	18	17.4
12.	King/Bay	1.76	1.66	0.95	36,892	20	6	12	10	13.0
13.	Mohawk/Paradise	1.73	1.72	1.00	23,816	15	20	16	13	14.8
14.	King/Longwood	1.66	1.77	1.07	17,059	10	1	5	5	5.6
15.	Queensdale/Gage	1.61	1.68	1.04	20,623	11	2	19	15	11.4
16.	Brampton/Parkdale	1.60	1.61	1.01	21,860	13	9	10	12	13.2
17.	Aberdeen/Queen	1.56	1.51	0.96	28,088	16	13	17	10	13.0
18.	Charlton/Queen	1.56	1.69	1.08	14,738	9	5	12	12	10.0
19.	Fennell/Sherman	1.56	1.54	0.99	25,261	14	11	21	12	15.0
20.	King/York (Dundas)	1.55	1.61	1.04	20,815	11	5	6	6	6.4
21.	Cannon/James	1.54	1.52	0.99	25,512	14	5	10	7	9.6
22.	Aberdeen/Dundurn	1.46	1.47	1.01	20,028	12	14	13	12	11.6

	Intersection	R_L / R_C	(a) R_L	(b) R_C	1982(c) AADT	Number of Collisions 1983	1982	1981	1980	5 YR AVG.
23.	Main/Dundurn	1.41	1.27	0.90	51,365	22	17	18	18	18.4
24.	Governors/Ogilvie (Dundas)	1.40	1.56	1.11	12,407	7	1	7	7	4.6
25.	Queensdale/Sherman	1.39	1.43	1.03	20,656	10	4	5	2	5.0
26.	King/Lake (Stoney Creek)	1.36	1.43	1.05	18,846	9	5	5	3	5.2
27.	Fennell/Wellington	1.34	1.31	0.97	29,383	13	12	11	7	10.6
28.	Queenston/Centennial	1.31	1.19	0.91	44,653	19	16	26	29	23.2
29.	King/Quigley	1.30	1.28	0.98	28,314	12	1	8	7	6.8
30.	Hunter/John	1.24	1.26	1.01	23,807	10	7	11	14	11.2
31.	Barton/Victoria	1.21	1.19	0.99	25,550	11	5	15	7	10.0
32.	Concession/Sherman	1.20	1.34	1.11	12,525	6	1	2	4	2.8
33.	Fennell/Garth	1.18	1.14	0.97	28,376	12	6	14	10	10.0
34.	Limeridge/Garth	1.18	1.31	1.11	14,573	6	3	3	6	5.2
35.	Limeridge/James	1.17	1.17	1.00	27,472	10	11	11	5	10.0
36.	Main/John	1.17	1.07	0.92	40,721	16	17	20	26	20.4
37.	Industrial/Ottawa	1.15	1.15	1.00	21,305	10	6	7	11	9.2
38.	Main/Macklin	1.14	1.16	1.01	24,192	9	8	9	19	10.6
39.	King/Victoria	1.14	1.08	0.95	33,685	13	9	21	15	14.4
40.	Rymal/James	1.14	1.12	0.98	27,434	11	14	11	10	10.6
41.	Cannon/Kenilworth	1.12	1.08	0.97	27,296	11	5	12	10	9.8
42.	King/Grays (Stoney Creek)	1.08	1.18	1.09	15,603	6	2	6	4	4.6

	Intersection	R_L / R_C	(a) R_L	(b) R_C	1982(c) AWDT	Number of Collisions 1983	1982	1981	1980	5 YR AVG.
43.	King William/John	1.07	1.21	1.13	11,878	5	1	2	2	3.0
44.	Cannon/Wellington	1.04	1.00	0.96	28,649	11	5	9	10	8.2
45.	Mohawk/Wentworth	1.04	1.04	1.00	30,746	9	13	5	9	8.8
46.	Mohawk/Gage	1.01	1.02	1.01	21,580	8	6	8	24	14.4
47.	Cannon/Hughson	1.00	1.03	1.04	19,438	7	3	5	13	7.0
48.	Yorke/Locke	1.00	0.94	0.94	36,296	12	15	15	8	12.0
49.	Main/Victoria	1.00	0.91	0.91	41,650	14	23	31	24	22.4
50.	Barton/Bay	0.99	1.10	1.11	13,334	5	6	3	3	3.8

NOTES:

(a) R_L is the number of collisions per million vehicles entering occurring within 31 feet of an individual intersection in 1983.

(b) R_C is a volume-adjusted critical rate. If R_L exceeds R_C (i.e. $\frac{R_L}{R_C}$ is greater than 1.00), one can state with 95 percent confidence that the collision rate at the intersection in question is significantly higher than would normally be expected.

$$R_C = R_a + K\sqrt{\frac{R_a}{m}} - \frac{0.5}{m}$$

where R_a = systemwide average collision rate for all traffic signal locations (0.61 collisions per million vehicle entries in 1983.

K = constant = 1.65 (for 95% confidence level)

m = vehicle exposure at the location in million vehicles entering per year $\left(\frac{\text{AWDT} \times 349.6}{10^6}\right)$

(c) AWDT - Average Weekday Daily Traffic; AADT - Average Annual Daily Traffic.

(*) Note: Rates presented are for 1983 only. Rates may fluctuate significantly from year to year. Therefore, caution should be exercised when drawing conclusions from the above table.

Exhibit 7-4

OVERALL COLLISION RATES FOR SELECTED GROUPS OF SIGNALIZED INTERSECTIONS

Intersections Included	Data for 1983 Only: Avg. No. of Collisions Per Year	Data for 1983 Only: Rate (Collisions/ Million Vehicles Entering)	Data for 1979-1983: Avg. No. of Collisions Per Year	Data for 1979-1983: Rate (Collisions/ Million Vehicles Entering)
All intersections	5.12	0.61	6.12	0.73
Intersections of one-way streets with one-way streets	5.12	0.58	6.23	0.71
Intersections of one-way streets with two-way streets	4.09	0.49	5.20	0.62
Intersections of two-way streets with two-way streets	5.46	0.67	6.37	0.79
Central business district intersections	4.46	0.49	6.54	0.72
C.B.D. fringe or industrial intersections	4.73	0.58	5.75	0.71
Suburban shopping-type intersections	6.17	0.66	7.37	0.79
Residential area intersections	4.33	0.61	4.69	0.66
All lower city intersections	4.93	0.57	6.10	0.70
All mountain intersections	6.19	0.82	6.91	0.92

COLLISION RATES AND AVERAGE NUMBER OF COLLISIONS SHOWED DECREASES IN 1983 COMPARED TO 1982, WITH THE EXCEPTION OF RESIDENTIAL AREA INTERSECTIONS AND MOUNTAIN INTERSECTIONS, WHICH SHOWED INCREASES OF 6 - 8 PERCENT.

CENTRAL BUSINESS DISTRICT INTERSECTIONS DISPLAYED A DECREASE IN COLLISIONS AND COLLISION RATES OF OVER 25 PERCENT IN 1983 COMPARED TO 1982.

ALL COLLISION RATES FOR THE FIVE-YEAR PERIOD 1979 - 1983 WERE LOWER THAN THE COMPARABLE RATES FOR THE PERIOD 1978 - 1982.

Exhibit 7-5

ROADWAY SECTIONS WITH THE HIGHEST COLLISION RATES, 1979 - 1983
CITY OF HAMILTON ARTERIALS
(ALL INTERSECTIONS INCLUDED) (a)

	Arterial Street	From	To	Number of Collisions	R_L	R_C	Ratio	Link Length	Link Volume	Million Veh-Km	1983 R_L
1.	Barton	James	Wellington	262.5	12.18	5.32	2.29	.836	14,753	4.31	10.44
2.	Kenilworth	Main	Barton	278.0	12.03	5.27	2.28	1.031	12,820	4.62	9.31
3.	Charlton	James	John	48.5	16.17	7.23	2.24	.244	7,000	0.60	21.67
4.	John	St. Joesph's	King	262.5	10.27	5.21	1.97	.976	14,970	5.11	8.41
5.	Barton	Ottawa	Kenilworth	301.0	9.38	5.07	1.85	.860	21,355	6.42	8.96
6.	Barton	Gage	Ottawa	292.0	9.34	5.09	1.84	.860	20,775	6.25	8.40
7.	Barton	Wellington	Wentworth	232.0	9.53	5.24	1.82	.872	15,987	4.87	10.57
8.	Barton	Wentworth	Sherman	232.5	9.39	5.23	1.80	.842	16,817	4.95	6.57
9.	John	King	Barton	115.0	10.00	5.79	1.73	.872	7,540	2.30	12.83
10.	Garth	Limeridge	Mohawk	45.0	12.00	6.95	1.73	.457	4,700	0.75	8.67
11.	Barton	Queen	James	104.0	9.41	5.83	1.61	.872	7,260	2.21	8.14
12.	Queen	Aberdeen	King	173.0	8.48	5.35	1.58	1.238	9,430	4.08	7.84
13.	Main	James	Wellington	324.0	7.53	4.92	1.53	.866	28,393	8.60	5.52
14.	Cannon	James	Wellington	200.0	7.92	5.22	1.52	.854	16,928	5.05	7.72
15.	Barton	Sherman	Gage	227.5	7.58	5.11	1.48	.872	19,667	6.00	7.00
16.	Fennell	U. Gage	U. Ottawa	128.5	8.18	5.54	1.48	.824	10,895	3.14	7.17
17.	James	King	Barton	122.0	8.16	5.58	1.46	.860	9,950	2.99	7.86
18.	James	Freeman	King	195.0	7.46	5.19	1.44	1.205	12,410	5.23	4.78
19.	Fennell	U. Ottawa	U. Kenilworth	62.0	9.32	6.31	1.48	.878	4,326	1.33	7.89
20.	Parkdale	Main	Barton	205.0	7.26	5.14	1.41	1.013	15,952	5.65	5.31

(a) See Notes, Page 100

	Arterial Street	From	To	Number of Collisions	R_L	R_C	Ratio	Link Length	Link Volume	Million Veh-Km	1983 R_L
21.	Charlton	Queen	James	104.5	7.89	5.67	1.39	.823	9,213	2.65	11.89
22.	Bay	Herkimer	King	111.5	7.53	5.59	1.35	.924	9,150	2.96	10.81
23.	Britannia	Barons	Strathearne	84.0	7.78	5.85	1.33	.488	12,685	2.16	8.33
24.	Main	Wellington	Wentworth	268.0	6.27	4.92	1.27	.854	28,636	8.55	4.09
25.	Main	Queen	James	264.5	6.08	4.91	1.24	.830	29,980	8.70	3.97
26.	U. Gage	Fennell	Concession	146.0	6.71	5.31	1.26	1.043	11,930	4.35	6.21
27.	Victoria	Stinson	King	83.0	7.38	5.81	1.27	.488	13,210	2.25	4.00
28.	Wilson	James	Wellington	145.5	6.47	5.28	1.22	.860	14,965	4.50	3.89
29.	Fennell	U. Sherman	U. Gage	99.0	6.90	5.61	1.23	.781	10,510	2.87	6.79
30.	Ottawa	Main	Barton	146.5	6.34	5.27	1.20	1.031	12,820	4.62	5.41
31.	King	James	Wellington	190.0	6.01	5.08	1.18	.878	20,582	6.32	4.43
32.	Barton	Kenilworth	Parkdale	330.0	5.54	4.77	1.16	1.525	22,355	11.92	4.74
33.	Fennell	U. Wentworth	U. Sherman	135.0	6.34	5.32	1.19	.854	14,255	4.26	7.28
34.	Mohawk	U. Sherman	U. Gage	129.5	6.40	5.36	1.19	.781	14,835	4.05	2.96
35.	Mohawk	U. Paradise	Garth	175.0	5.94	5.12	1.15	.839	20,095	5.89	5.35
36.	Cannon	Gage	Ottawa	146.0	6.13	5.25	1.16	.866	15,735	4.76	3.36
37.	Cannon	Sherman	Gage	146.0	6.07	5.25	1.16	.891	15,443	4.81	4.78
38.	Barton	Nash	Centennial	195.0	5.74	5.04	1.14	.836	23,277	6.80	6.54
39.	Ottawa	Barton	Industrial	166.0	5.86	5.14	1.14	1.279	12,673	5.67	3.97
40.	Parkdale	Barton	Burlington	211.5	5.62	4.99	1.13	1.421	15,155	7.53	3.65
41.	Queenston	Nash	Hamilton City Limit	204.5	5.56	5.00	1.11	.823	25,585	7.36	3.80
42.	Gage	Lawrence	King	89.5	6.19	5.61	1.10	.982	8,405	2.89	4.50
43.	King	Parkdale	Nash	315.5	4.98	4.74	1.05	1.708	21,207	12.66	5.33
44.	King	Gage	Main	112.0	5.57	5.36	1.04	.610	18,830	4.02	4.10
45.	Garth	Mohawk	Fennell	124.0	5.44	5.28	1.03	1.311	9,945	4.56	4.93
46.	Charlton	Wellington	Wentworth	86.5	5.75	5.57	1.03	.854	10,085	3.01	4.98

Exhibit 7-6

ROADWAY SECTIONS WITH THE HIGHEST COLLISION RATES, 1979 - 1983
CITY OF HAMILTON ARTERIALS
(SIGNALIZED INTERSECTIONS NOT INCLUDED) (a)

	Arterial Street	From	To	Number of Collisions	R_L	R_C	Ratio	Link Length	Link Volume	Million Veh-Km	1983 R_L
1.	Charlton	James	John	46.0	15.33	5.20	2.95	.244	7,000	0.60	21.67
2.	Kenilworth	Main	Barton	223.0	9.65	3.73	2.59	1.031	12,820	4.62	6.93
3.	Barton	James	Wellington	192.0	8.91	3.77	2.36	.836	14,753	4.31	6.73
4.	Barton	Queen	James	99.0	8.96	4.16	2.15	.872	7,260	2.21	7.24
5.	Barton	Ottawa	Kenilworth	237.0	7.38	3.57	2.07	.860	21,355	6.42	6.85
6.	Barton	Gage	Ottawa	230.0	7.36	3.58	2.06	.860	20,775	6.25	7.04
7.	Barton	Wellington	Wentworth	170.0	6.98	3.70	1.89	.872	15,987	4.87	8.01
8.	Barton	Wentworth	Sherman	154.0	6.22	3.69	1.69	.842	16,817	4.95	6.73
9.	Britannia	Barons	Strathearne	73.5	6.81	4.18	1.63	.488	12,685	2.16	7.64
10.	Barton	Sherman	Gage	161.0	5.37	3.60	1.49	.872	19,667	6.00	6.17
11.	Garth	Limeridge	Mohawk	27.0	7.20	5.01	1.44	.457	4,700	0.75	4.00
12.	Fennell	U. Ottawa	U. Kenilworth	42.5	6.39	4.53	1.41	.878	4,326	1.33	2.71
13.	Fennell	U. Gage	U. Ottawa	83.0	5.29	3.94	1.34	.824	10,895	3.14	5.26
14.	Ottawa	Main	Barton	115.0	4.98	3.73	1.34	1.031	12,820	4.62	4.55
15.	Queenston	Nash	Hamilton City Limit	168.0	4.57	3.51	1.30	.823	25,585	7.36	2.85
16.	Charlton	Queen	James	70.0	5.28	4.05	1.30	.823	9,213	2.65	9.06
17.	King	Gage	Main	96.0	4.78	3.80	1.26	.610	18,830	4.02	3.23
18.	Ottawa	Barton	Industrial	130.0	4.59	3.63	1.26	1.279	12,673	5.67	3.05
19.	Queen	Aberdeen	King	97.0	4.75	3.79	1.25	1.238	9,430	4.08	3.68
20.	Parkdale	Main	Barton	124.0	4.39	3.63	1.21	1.013	15,952	5.65	2.77

(a) See Notes, Page 100

	Arterial Street	From	To	Number of Collisions	R_L	R_C	Ratio	Link Length	Link Volume	Million Veh-Km	1983 R_L
21.	John	King	Barton	57.0	4.96	4.14	1.20	.872	7,540	2.30	6.52
22.	Mohawk	U. Sherman	U. Gage	92.0	4.54	3.80	1.19	.781	14,835	4.05	2.22
23.	Barton	Kenilworth	Parkdale	234.0	3.93	3.33	1.18	1.525	22,355	11.92	3.61
24.	Cannon	Gage	Ottawa	103.0	4.33	3.71	1.17	.866	15,735	4.76	2.25
25.	Fennell	U. Wentworth	U. Sherman	94.0	4.41	3.77	1.17	.854	14,255	4.26	4.69
26.	U. Wentworth	Fennell	Concession	45.0	5.06	4.31	1.17	1.031	4,930	1.78	5.62
27.	King	Kenilworth	Parkdale	215.0	3.88	3.35	1.16	1.513	20,922	11.07	3.16
28.	Mohawk	U. Paradise	Garth	121.0	4.11	3.61	1.14	.839	20,095	5.89	3.57
29.	James	Freeman	King	108.0	4.13	3.67	1.13	1.205	12,410	5.23	2.29
30.	Wentworth	Barton	Burlington	48.0	4.66	4.21	1.11	1.031	5.725	2.06	3.88
31.	Cannon	Sherman	Gage	99.0	4.12	3.71	1.11	.891	15,443	4.81	3.53
32.	Gage	Lawrence	King	63.5	4.39	3.99	1.10	.982	8,405	2.89	3.46
33.	U. James	Limeridge	Mohawk	146.0	3.71	3.48	1.07	1.049	21,490	7.88	3.55
34.	Parkdale	Barton	Burlington	139.0	3.69	3.50	1.05	1.421	15,155	7.53	1.99
35.	Barton	Nash	Centennial	127.0	3.74	3.55	1.05	.836	23,277	6.80	4.56
36.	King	Wellington	Wentworth	137.0	3.68	3.51	1.05	.866	24,610	7.45	2.95
37.	Main	James	Wellington	155.0	3.60	3.45	1.04	.866	28,393	8.60	2.44
38.	Main	Gage	Ottawa	134.0	3.65	3.51	1.04	.866	24,290	7.35	3.67
39.	James	King	Barton	61.0	4.08	3.97	1.03	.860	9,950	2.99	3.68
40.	Sherman	Main	King	32.0	4.48	4.48	1.00	.427	9,600	1.43	2.80
41.	King	Parkdale	Nash	209.0	3.30	3.31	1.00	1.708	21,207	12.66	3.48
42.	Mud	Mtn Brow Blvd.	Mt. Albion	77.0	3.79	3.80	1.00	1.098	10,576	4.06	3.69

Exhibit 7-7

ROADWAY SECTIONS WITH THE HIGHEST COLLISION RATES, 1979 - 1983
CITY OF HAMILTON ARTERIALS
(INTERSECTIONS NOT INCLUDED) (a)

	Arterial Street	From	To	Number of Collisions	R_L	R_C	Ratio	Link Length	Link Volume	Million Veh-Km	1983 R_L
1.	Barton	James	Wellington	92.0	4.27	2.45	1.74	.836	14,753	4.31	2.32
2.	Barton	Ottawa	Kenilworth	125.0	3.89	2.31	1.68	.860	21,355	6.42	4.83
3.	Barton	Nash	Centennial	127.0	3.74	2.29	1.63	.836	23,277	6.80	4.56
4.	Kenilworth	Main	Barton	88.0	3.81	2.42	1.57	1.031	12,820	4.62	3.68
5.	Charlton	James	John	16.0	5.33	3.41	1.56	.244	7,000	0.60	6.67
6.	Fennell	U. Gage	U. Ottawa	63.0	4.01	2.58	1.55	.824	10,895	3.14	3.82
7.	Garth	Limeridge	Mohawk	19.0	5.07	3.29	1.54	.457	4,700	0.75	4.00
8.	Barton	Gage	Ottawa	112.0	3.58	2.32	1.54	.860	20,775	6.25	3.52
9.	Barton	Wellington	Wentworth	87.0	3.57	2.40	1.49	.872	15,987	4.87	3.90
10.	U. James	Limeridge	Mohawk	129.0	3.27	2.24	1.46	1.049	21,490	7.88	2.66
11.	Queenston	Nash	Hamilton City Limit	119.0	3.23	2.26	1.43	.823	25,585	7.36	1.77
12.	Parkdale	Main	Barton	95.0	3.36	2.35	1.43	1.013	15,952	5.65	1.60
13.	Barton	Wentworth	Sherman	81.0	3.27	2.40	1.36	.842	16,817	4.95	2.02
14.	Main	James	Wellington	128.0	2.98	2.22	1.34	.866	28,393	8.60	1.86
15.	Fennell	U. Ottawa	U. Kenilworth	26.0	3.91	2.99	1.31	.878	4,326	1.33	3.01
16.	Mohawk	U. Paradise	Garth	90.0	3.06	2.34	1.31	.839	20,095	5.89	2.55
17.	Barton	Kenilworth	Parkdale	157.0	2.63	2.13	1.23	1.525	22,355	11.92	1.93
18.	Ottawa	Barton	Industrial	82.0	2.89	2.35	1.23	1.279	12,673	5.67	1.96
19.	John	King	Barton	38.0	3.30	2.72	1.21	.872	7,540	2.30	4.35
20.	King	Parkdale	Nash	151.0	2.39	2.11	1.13	1.708	21,207	12.66	2.45

(a) See Notes, Page 100

	Arterial Street	From	To	Number of Collisions	R_L	R_C	Ratio	Link Length	Link Volume	Million Veh-Km	1983 R_L
21.	Queenston	Parkdale	Nash	138.0	2.40	2.14	1.12	1.623	20,286	11.51	2.09
22.	James	Freeman	King	69.0	2.64	2.38	1.11	1.205	12,410	5.23	1.53
23.	Barton	Sherman	Gage	77.0	2.57	2.33	1.10	.872	19,667	6.00	3.00
24.	Wentworth	King	Barton	29.0	2.99	2.80	1.07	.820	6,765	1.94	3.09
25.	King	James	Wellington	76.0	2.41	2.31	1.04	.878	20,582	6.32	1.90
26.	James	King	Barton	40.0	2.68	2.60	1.03	.860	9,950	2.99	2.34
27.	Mohawk	U. Wellington	U. Wentworth	67.0	2.38	2.35	1.01	.878	18,375	5.64	1.60

NOTES Re: Collision Rates on Roadway Sections

(a) Exhibit 7-5 includes all collisions on an arterial roadway section. If the roadway section ends at an intersection, signalized or unsignalized, one-half the number of collisions occurring at the intersection is included.

(b) Exhibit 7-6 includes all collisions on an arterial roadway section excluding those which occur within nine metres of a signalized intersection. If the roadway section ends at an unsignalized intersection, one-half the number of collisions occurring at the intersection is included.

(c) Exhibit 7-7 includes only collisions on an arterial roadway section which occur greater than nine metres from any intersection. That is, no collisions referenced to an intersection, signalized or unsignalized, are included.

(d) R_L is the collision rate for the roadway section expressed as collisions per million vehicle kilometres travelled per annum.

(e) R_C is a volume-adjusted critical rate. If R_L exceeds R_C (i.e. $\frac{R_L}{R_C}$ is greater than 1.00), one can state with 95 percent confidence that the collision rate for the roadway section in question is significantly higher than would normally be expected.

$$R_C = R_a + K\sqrt{\frac{R_a}{m}} - \frac{0.5}{m}$$

where R_a = systemwide average collision rate for all roadway sections (3.87 collisions per million vehicle kilometers in 1979-1983 for Exhibit 7-5; 2.60 collisions per million vehicle kilometres in 1979-1983 for Exhibit 7-6; 1.57 collisions per million vehicle kilometres in 1979-1983 for Exhibit 7-7).

K = constant = 1.65 (for 95% confidence level)

m = vehicle exposure for the individual roadway section in million vehicle kilometres per year
(AWDT x $\frac{349.6}{10^6}$ x Section Length)

(f) AWDT - Average Weekday Daily Traffic

Exhibit 7-8

ARTERIAL ROADWAY SECTIONS COLLISION RATES FOR SELECTED GROUPS

Category	Collision Rate (Collisions Per Million Vehicle Kilometres) Including All Intersections	Signalized Intersections Not Included	Intersections Not Included
All Arterials 1983	3.34	2.30	1.38
All Arterials 1982	3.59	2.47	1.48
All Arterials 1981	4.04	2.69	1.66
All Arterials 1980	4.00	2.65	1.61
All Arterials 1979	4.33	2.90	1.76
All Arterials 1978	4.06	2.77	1.63
All Arterials 1977	4.74	3.25	2.01
All Arterials 1979 - 83	3.87	2.60	1.58

ROADWAY SECTION COLLISION RATES, INCLUDING ALL INTERSECTIONS, HAVE DISPLAYED A DECLINE FROM 1977 - 1983.

ROADWAY SECTION COLLISION RATES, EXCLUDING SIGNALIZED INTERSECTIONS, HAVE DISPLAYED A DECINE FROM 1977 - 1983.

ROADWAY SECTION COLLISION RATES, EXCLUDING THE EFFECTS OF ALL INTERSECTIONS, HAVE DISPLAYED A DECLINE FROM 1977 - 1983.

Appendix

Exhibit A-1

CAUSES OF DEATH 1980 (1)

Cause	Rate/100,000 Population Canada	Ontario
Diseases of the Heart and Circulatory Diseases	323.6	345.9
All Malignant Neoplasms	165.2	167.0
All Accidents and Adverse Effects (Including Late Effects)	65.7(2)	56.9 (2)
Respiratory Diseases (Excluding Infections and Parasitic Diseases)	46.7	46.5
Diabetes Mellitus	12.0	12.0
Chronic Liver Disease and Cirrhosis	11.2	11.3
Causes of Perinatal Mortality Excluding Stillbirths	6.9	6.2
Congenital Anomalies	6.7	6.1
All Other Causes Not Specified in the Above List	77.8	79.8
All Causes	715.8	731.7

NOTES: (1) From Statistics Canada, Vital Statistics, Volume III, Mortality, 1979 and 1980, p. 12-15.

(2) Motor Vehicle Collisions Alone - 22.5 for Canada, 17.8 for Ontario.

Exhibit A-2

ACCIDENTAL CAUSES OF DEATH 1980 (1)

	Number		Death Rate/100,000	
Cause	Canada	Ontario	Canada	Ontario
Traffic Accidents	5,397	1,527	22.5	17.8
Accidental Falls	1,848	663	7.7	7.7
Fires	747	229	3.1	2.7
Drowning	570	150	2.4	1.7
Other Transport	548	194	2.3	2.3
Accidental Poisoning	443	203	1.9	2.4
Suffocation	423	148	1.8	1.7
Motor Vehicle (non-traffic related)	144	57	0.6	0.6
Explosives, Acid, Electricity	117	37	0.5	0.4
Firearms	74	21	0.3	0.2
Lightning	8	3	0.1	0.1
All Other	908	262	3.8	3.1

(1) Statistics Canada, Vital Statistics, Volume III, Mortality, 1979 and 1980, p. 180-183.

Exhibit A-3

ACCIDENTAL CAUSES OF DEATH 1980 (14 YRS. OF AGE AND UNDER) (1)

Cause	Number of Fatalities In Canada
Traffic Accidents	559
Fires	187
Drowning	171
Suffocation	98
Other Transport	35
Accidental Falls	35
Firearms	21
Motor Vehicle (Non-Traffic Related)	21
Accidental Poisoning	12
Explosives, Acid, Electricity	9
Lightning	1
All Other	147

(1) Statistics Canada, Volume III, Mortality, 1979 and 1980, p. 104-106.

Exhibit A-4

POPULATION AND REGISTRATION

Year	Population Hamilton	Motor Vehicle Registration (a) Ontario	Hamilton	Ratio: Motor Vehicle Registration to Population
1950	n/a	1,104,080	47,043	
1951	201,296	1,205.098	50,648	0.25
1952	210,060	1,291,753	55,169	
1953	216,921	1,406,119	59,808	
1954	222,907	1,489,980	62,728 (b)	
1955	225,608	1,617,853	67,497	
1956	233,019	1,710,240	70,034 (b)	0.30
1957	243,097	1,793,499	72,156	
1958	251,256	1,868,922	75,763	
1959	258,576	1,973,737	80,365	
1960	263,750	2,062,484	82,823	
1961	266,707	2,126,270	85,667	0.32
1962	268,908	2,177,148	83,779	
1963	264,706	2,268,320	89,005	
1964	278,260	2,381,219	93,208	
1965	283,099	2,516,680	102,171	
1966	285,649	2,643,474	107,506	0.38
1967	291,536	2,736,366	107,521	
1968	293,397	2,869,588	116,452	
1969	296,875	2,953,789	116,135	
1970	298,755	3,047,599	114,760	
1971	303,177	3,209,862	120,727	0.39
1972	304,391	3,382,497	134,623 (b)	
1973	305,382	3,583,379	140,687	
1974	401,932 (e)	3,891,603	154,886 (d)	
1975	408,466 (e)	4,079,108	162,348 (d)(g)	
1976	409,331 (e)	4,089,954 (c)	162,780 (d)	0.52 (f)
1977	411,358 (e)	4,274,410 (c)	170,122 (d)	
1978	407,486 (e)	n/a	228,149 (h)	
1979	407,758 (e)	n/a	190,884 (h)	
1980	410,503 (e)	n/a	230,459 (h)	
1981	n/a	n/a	277,813 (h)	0.68 (j)
1982	n/a	n/a	296,288 (h)	

NOTES:

(a) Registration is for all vehicles including automobiles, station wagons and commercial vehicles. Sources of data, Hamilton Police Reports, R. L. Polk and Company, Statistics Canada and The Ministry of Transportation and Communications of Ontario.

(b) Data not available. Estimated from provincial value.

(c) Estimated by the Ministry of Transportation and Communications.

(d) Data estimated from provincial value for City of Hamilton only.

(e) Population for Regional Municipality of Hamilton-Wentworth.

(f) For City of Hamilton only.

(g) R. L. Polk estimate for Region of Hamilton-Wentworth for 1975 - 180,084.

(h) Ministry of Transportation and Communications estimate for Region based on licence sales only, for Regional Hamilton-Wentworth.

(j) For Regional Municipality of Hamilton-Wentworth.

Exhibit A-5

MOTOR VEHICLE ACCIDENT DEATHS AND RATES

YEAR	DEATHS Canada	Ontario	Hamilton	RATES/10,000 REGISTERED MOTOR VEHICLES Canada	Ontario	Hamilton
1931	1,316	574	31	10.96	10.21	
1932	1,120	497	20	10.05	9.35	
1933	955	416	22	8.82	8.00	
1934	1,115	528	27	9.82	9.74	
1935	1,224	571	16	10.42	10.12	
1936	1,316	564	23	10.61	9.56	
1937	1,642	774	39	12.37	12.41	
1938	1,545	677	33	11.08	10.12	
1939	1,584	682	35	11.01	9.99	n/a
1940	1,723	756	46	11.46	10.74	
1941	1,852	835	45	11.78	11.30	
1942	1,409	610	49	9.24	8.53	
1943	1,437	563	41	9.51	8.14	
1944	1,374	526	28	9.14	7.79	
1945	1,556	637	25	10.39	9.61	
1946	1,781	729	33	10.98	10.25	
1947	1,869	753	26	10.17	9.41	
1948	2,086	782	19	10.25	8.94	5.34
1949	2,265	873	29	9.89	9.00	n/a
1950	2,270	850	12	8.74	7.70	2.55
1951	2,686	991	26	9.36	8.22	5.13
1952	2,701	1,040	26	8.56	8.05	4.71
1953	2,906	1,082	17	8.47	7.69	2.84
1954	1,960 (a)	1,045	17	5.38 (a)	7.01	2.71
1955	2,084 (a)	1,111	15	5.28 (a)	6.87	2.22
1956	3,184	1,180	25	7.46	6.90	3.57
1957	3,260	1,279	25	7.25	7.13	3.46
1958	3,113	1,112	21	6.61	5.94	2.77
1959	3,231	1,187	18	6.44	6.01	2.24

YEAR	DEATHS			RATES/10,000 REGISTERED MOTOR VEHICLES		
	Canada	Ontario	Hamilton	Canada	Ontario	Hamilton
1960	3,283	1,166	21	6.25	5.65	2.54
1961	3,426	1,286	19	6.21	6.05	2.22
1962	3,883	1,383	32	6.72	6.35	3.82
1963	4,210	1,421	27	6.93	6.26	3.03
1964	4,652	1,424	32	7.29	5.98	3.43
1965	4,902	1,611	27	7.31	6.40	2.64
1966	5,281	1,596	28	7.51	6.04	2.60
1967	5,429	1,719	39	7.26	6.28	3.63
1968	5,318	1,586	22	6.74	5.53	1.89
1969	5,425	1,683	19	6.57	5.70	1.64
1970	5,080	1,535	23	5.97	5.04	2.00
1971	5,573	1,769	23	6.17	5.51	1.91
1972	6,221	1,934	46	6.56	5.72	3.42
1973	6,706	1,959	23	6.60	5.47	1.63
1974 (b)	6,290	1,748	31	5.72	4.49	2.00
1975	6,061	1,800	26	5.29	4.41	1.60
1976		1,511	29		3.70	1.78
1977	n/a	1,420	34	n/a	3.27	2.00
1978		1,450	47		3.23	2.06
1979		1,560	42		3.36	2.20
1980		1,508	33		3.17	1.43
1981		1,445	31		2.86	1.16
1982		1,138	23		1.88	0.77
1983			20			n/a

(a) Except Quebec.

(b) Reporting area expanded to include new areas patrolled by the Hamilton-Wentworth Regional Police.

Exhibit A-6

HAMILTON/HAMILTON-WENTWORTH PEDESTRIAN INJURY RATES HISTORIC TRENDS

YEAR	PEDESTRIAN	
	Injuries Per 1,000 Population	Fatalities Per 100,000 Population
1951	1.41	7.45
1952	2.13	6.19
1953	2.14	4.14
1954	1.97	5.83
1955	2.29	3.10
1956	1.92	9.01
1957	2.16	6.17
1958	1.78	5.57
1959	1.76	5.03
1960	1.60	4.93
1961	1.96	4.12
1962	1.84	4.83
1963	2.11	5.67
1964	1.89	7.19
1965	2.05	6.00
1966	2.07	5.95
1967	1.89	5.83
1968	2.11	3.41
1969	2.03	2.02
1970	1.81	4.69
1971	1.84	4.29
1972	1.76	6.90
1973	1.87	2.95
1974 (a)	1.41	3.23
1975	1.28	2.69
1976	1.18	3.42
1977	1.22	2.43
1978	1.34	6.14
1979	1.14	3.68
1980	1.03	2.93
1981	1.13	2.50
1982	1.00	2.46
1983	0.95	1.23

Note: See also Exhibit 1-2

(a) Reporting area expanded to include new areas patrolled by the Hamilton-Wentworth Regional Police.

Exhibit A-7

TRENDS DATA
REGRESSION EQUATIONS

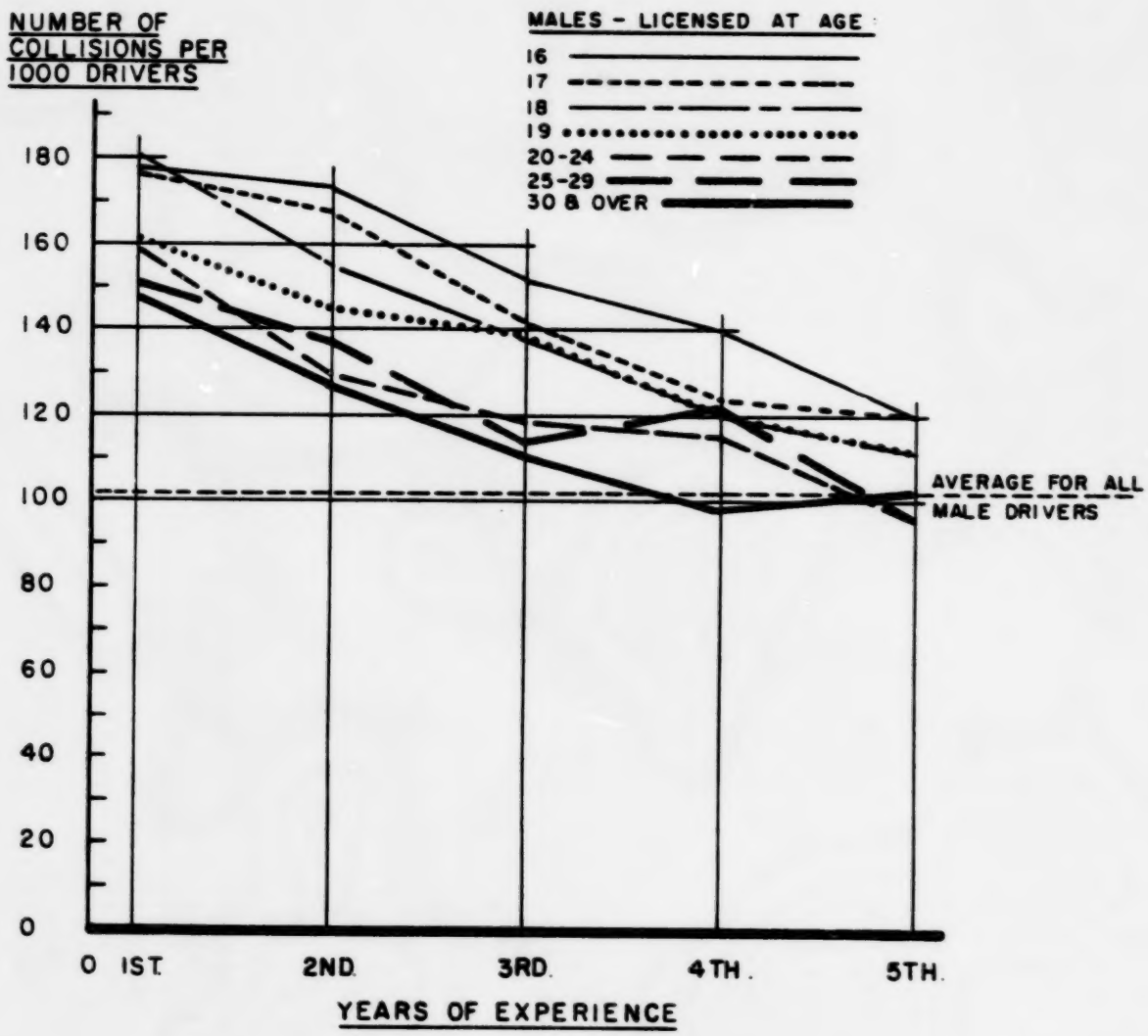
Statistic	Years	Equation [a]	Significant Slope at 95%	99% [b]	Range of Significant Slope at 95%
1. Collision Rate - All [c]	1951 - 1983	y = -0.179 x + 29.53	No	No	-0.390 to 0.032
2. Collision Rate - All [c]	1965 - 1983	y = -0.928 x + 34.86	Yes	Yes	-1.112 to -0.744
3. Injury Collision Rate	1954 - 1983	y = 0.091 x + 6.25	Yes	Yes	0.030 to 0.152
4. Injury Collision Rate	1965 - 1983	y = -0.131 x + 9.82	Yes	Yes	-0.190 to -0.072
5. Personal Injury Rate	1951 - 1983	y = 0.241 x + 6.43	Yes	Yes	0.163 to 0.318
6. Personal Injury Rate	1963 - 1983	y = -0.098 x + 13.07	Yes	No	0.006 to 0.190
7. Pedestrian Injury Rate	1951 - 1983	y = -0.031 x + 2.23	Yes	Yes	-0.041 to -0.021
8. Fatality Rate - All Collisions	1951 - 1983	y = -0.076 x + 10.21	No	No	-0.169 to 0.014
9. Pedestrian Fatality Rate	1951 - 1983	y = -0.116 x + 6.59	Yes	Yes	-0.170 to -0.062

(a) The variable "x" represents the year; "y" the number of collisions expected.
"x" is 1.0 for the first year included in the equation.
"y" is in collisions per 1,000 population for 1 and 2; in injuries per 1,000 population for 3, 4 and 5; and in fatalities per 100,000 population in 6 and 7.

(b) If the slope of the regression line is significant, we can state with the indicated level of confidence that the slope is not equal to zero.

(c) Includes changes in reporting criteria and reporting area. For this reason, conclusions drawn from this regression line may not be entirely meaningful or appropriate.

EFFECT OF EXPERIENCE ON COLLISION INVOLVEMENT OF NEW DRIVERS



SOURCE - SYSTEMS RESEARCH & DEVELOPMENT,
ONTARIO MINISTRY OF TRANSPORTATION & COMMUNICATIONS

Exhibit A-9

COLLISION STATISTICS - SELECTED CANADIAN CITIES

City or Regional Municipality	Population	Property Damage Only - Collision Reporting Level	Collision Reporting Criteria (1) (a)	(b)	(c)	(d)	Other	Total Collisions	Collisions/ 1,000 Population	Injury Collisions	Injury Collisions/ 1,000 Population
Regional Hamilton-Wentworth	407,000 (1982)	$400.00	No	No	Yes	Yes	(f)	7,268	17.9	2,859	7.0
City of Hamilton	307,000 (1982)	$400.00	No	No	Yes	Yes	(f)	5,821	19.0	2,262	7.4
Burlington	114,000 (1983)	$400.00	No	No	No	Yes		1,540	13.5	567	5.0
Calgary	620,692 (1983)	$500.00	Yes	Yes	Yes	Yes	(f)	32,618	52.6	2,161	3.5
Edmonton	560,085 (1983)	$500.00	No	No	No	Yes		21,324	38.1	4,611	8.2
Halifax	114,594 (1981)	$500.00	Yes	Yes	Yes	Yes		3,935	34.3	488	4.3
London	268,051 (1983)	$400.00	Yes	Yes	Yes	Yes	(e)(f)	7,892	29.4	1,986	7.4
City of Montreal	1,020,720 (1983)	$250.00	No	No	Yes	Yes		23,209 (g)	22.7	6,176	6.1
Regional Ottawa-Carleton	569,747 (1983)	$400.00	No	No	No	Yes		14,972	26.3	4,200	7.4
Regina (3)	171,303 (1983)	$500.00	No	No	No	Yes		8,917	52.1	1,457	8.5
Saskatoon	164,304 (1983)	$200.00	No	No	No	Yes		9,346	56.9	720	4.4
Metro Toronto	2,137,960 (1983)	$400.00	Yes	Yes	Yes	Yes	(e)	49,883	23.3	14,608	6.8
Vancouver	416,139 (1983)	(h) $400.00	No	No	Yes	Yes		21,983	52.8	2,524	6.1
Windsor (2)	192,546 (1982)	$400.00	Yes	Yes	Yes	Yes		4,167	21.6	1,583	8.2
Winnipeg	594,701 (1983)	$500.00	Yes	Yes	Yes	Yes		17,781	29.9	4,703	7.9

(1) KEY TO CRITERIA FOR REPORTING COLLISIONS (See next page for definition of injury collisions)
It is generally assumed, unless otherwise noted, that only collisions occurring on public roadways involving personal injury or property damage greater than the reporting level are included on this table.
(a) Collisions reported involving an infraction of the Provincial Highway Traffic Act with property damage only and less than reporting level.
(b) Collisions reported involving an infraction of the Criminal Code of Canada with property damage only and less than reporting level.
(c) Hit and run collisions reported with property damage only and less than reporting level.
(d) Collision reported if it involves any personal injury.
(e) Public property damage collisions.
(f) Collisions involving City or Regional government vehicles.
(g) "With the introduction of amicable constat by insurance companies in July, 1979, a great number of accidents with material damages are not reported and are out of control".
(h) estimated

(2) Collision statistics quoted are for 1982. 1983 data not available.

(3) Only injuries requiring medical attention were classified as injury collisions.

DEFINITIONS OF "PERSONAL INJURY" (a)

Regional Hamilton-Wentworth	-	any bodily harm, visible or complained of, that results from a motor vehicle collision.
City of Hamilton	-	any bodily harm, visible or complained of, that results from a motor vehicle collision.
Burlington	-	any bodily harm, visible or complained of, that results from a motor vehicle collision.
Calgary	-	any type of injury resulting from a collision.
Edmonton	-	includes minor abrasions and bruises, complaint of pain, caused by a motor vehicle collision.
Halifax	-	injury or death (no stipulation regarding severity of injury) caused by a motor vehicle collision.
London	-	any type of injury caused by a collision; need not be treated at a hospital.
City of Montreal	-	any injury, apparent or not, to any person, caused directly or indirectly, by a motor vehicle.
Regional Ottawa-Carleton	-	injury is any bodily harm visible or complaint of, caused by a motor vehicle collision.
City of Regina	-	any bodily harm, visible or complaint of, caused by the accident.
Saskatoon	-	any bodily harm, visible or complaint of, caused by a collision.
Metro Toronto	-	injury must be reported when an injury occurs to any of the involved persons in a collision.
Vancouver	-	up to descretion of driver or police if in attendance.
Windsor	-	any injury resulting from a motor vehicle collision.
Winnipeg	-	readily identifiable injury or perceived injury caused by a collision.

(a) definitions of a "personal injury" such that a collision involving a personal injury must be reported.

Exhibit A-10

FATAL COLLISION STATISTICS - CANADIAN AND U.S. CITIES (1)

CITY	# OF FATALITIES 1981	RATE PER 100,000 POPULATION	RATE PER 10,000 REGISTERED VEHICLES
HAMILTON (2)	21	7.0	1.2
AVERAGE OF ALL CANADIAN CITIES REPORTING TO N.S.C. (7 CITIES)	36.4	10.3	2.6
London, Ontario	12	6.2	1.6
Montreal, Quebec	90	7.4	2.2
Lethbridge, Alberta	4	10.9	2.4
Calgary, Alberta	53	16.0	3.6
Edmonton, Alberta	70	18.6	4.3
Medicine Hat, Alberta	5	19.9	4.4
AVERAGE OF ALL U.S. CITIES, POPULATION 200,000 - 350,000 REPORTING TO N.S.C. (27 CITIES)	38.9	14.5	2.2
Rochester, N.Y.	16	6.6	0.9
St. Paul, Minn.	19	7.2	1.0
Norfolk, Va.	22	7.8	1.8
Louisville, Ky.	28	8.8	1.1
Akron, Ohio	23	9.6	1.3
Oakland, Cal.	33	9.7	1.7
Newark, N.J.	32	10.2	2.1
Shreveport, La.	21	10.4	1.4
Richmond, Va	23	10.5	1.8
Anchorage, Alas.	22	10.9	1.2
Albuquerque, N.M.	35	11.9	1.7
Anaheim, Cal.	26	12.6	1.6
Baton Rouge, La.	40	12.9	2.8

CITY	# OF FATALITIES 1981	RATE PER 100,000 POPULATION	RATE PER 10,000 REGISTERED VEHICLES
Virginia Beach, Va.	32	13.1	3.2
Charlotte, N.C.	40	13.4	2.5
Colorado Springs, Colo.	30	14.5	1.9
St. Petersburg, Fla.	35	15.2	1.9
Austin, Tex.	52	16.3	3.1
Long Beach, Cal.	56	16.5	2.4
Birmingham, Ala.	50	17.8	2.4
Sacramento, Cal.	49	17.9	2.2
Corpus, Christi, Tex.	41	19.1	3.3
Mobile, Ala.	41	19.7	3.7
Wichita, Kans.	56	20.9	2.5
Tampa, Fla.	60	22.7	2.8
Tucson, Ariz.	81	24.4	3.7
Miami, Fla.	87	25.0	3.3

NOTE:

(1) SOURCE: Accident Facts, 1982 Edition, National Safety Council, 444 N. Michigan Avenue, Chicago, Ill. Please note statistics are for 1981 calendar year.

(2) Rate is for City of Hamilton only.